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UNCLASSIFIED TITLE PRESSURE SPECTRA AND SPACE CORRELATIONS FROM AERODYNAMIC NOISE TEST, AD-366 P-1, SPO #149 and 150

MODEL NO. X-20A CONTRACT NO. AF 33(657)-7132

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This document is submitted in compliance with the requirements of paragraphs B(1.1.1.1.1) and B(1.1.1.1.1.4) of the Statement of Work, System 620A, Exhibit 620A-62-2, dated 26 January 1962, revised 1 August 1962.

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1.0 INTRODUCTION

This report is the result of work accomplished on EWA 5-470.

Aerodynamically excited fluctuating pressures are expected to be the main force of structural vibration during flight. The significance of this aerodynamic phenomena is not established because little experimental data is available on both the pressure magnitude and space-time correlation of the fluctuating pressure field. Therefore, a test program was underteken with the primary objective of obtaining experimental back-up data for estimates of the X-20 flight acoustic environment.

The test program was conducted at the Boeing Transonic (April 18-19, 1962) and Supersonic (March 22-23, 1962) Wind Tunnels utilizing a .066 Scale X-20 2050D glider.

The results of the test program are reported in Section 4.5 (transonic wind tunnel) and Section 5.5 (supersonic wind tunnel). All acoustic data contained in this report are direct model data. Analysis of the data for application to the full scale X-20 glider will be conducted by X-20 Structures and Materials Technology.

Vibration sensitivity of the transducers obscured much of the acoustic data below 145 db. However, extensive data were obtained on spectra and space correlation at locations where the aerodynamic noise levels ranged from 145 db (± .052 psi RMS) to 165 db (± 0.52 psi RMS).

2.0 MODEL DESCRIPTION

Wind tunnel Model AD-366P-1, a .066 scale model of the X-20 20[illegible]D Glider, was strut-sting mounted with nineteen Statham pressure transducers installed to measure the magnitude and space correlation of fluctuating pressures on the model glider. Three accelerometers were located inside the glider canopy to measure model vibration during the test program.

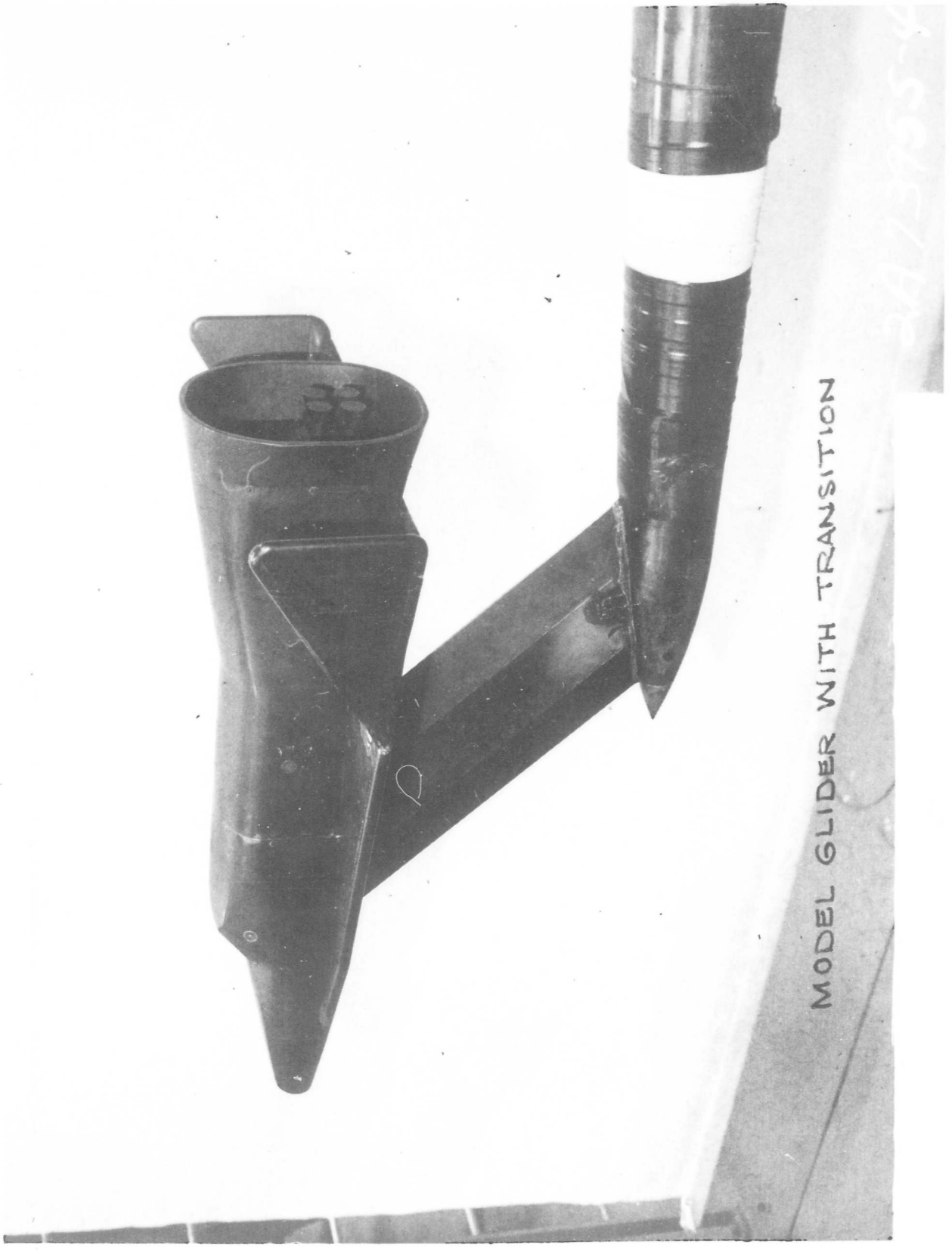
Two general model configurations were used throughout the tests:

1. Glider with transition (See Figure 2.0-1).

2. Glider without transition (See Figure 2.0-2).

Figures 2.0-3 and 2.0-4 show the glider canopy, wing, fin and [illegible] at an early stage of construction. Featured in these figures are the probes used in the acoustic measurement system.

Detail locations of all glider pressure transducers used during the wind tunnel program are shown in Figure 2.0-5.



MODEL GLIDER WITH TRANSITION

FIGURE 2.0-1

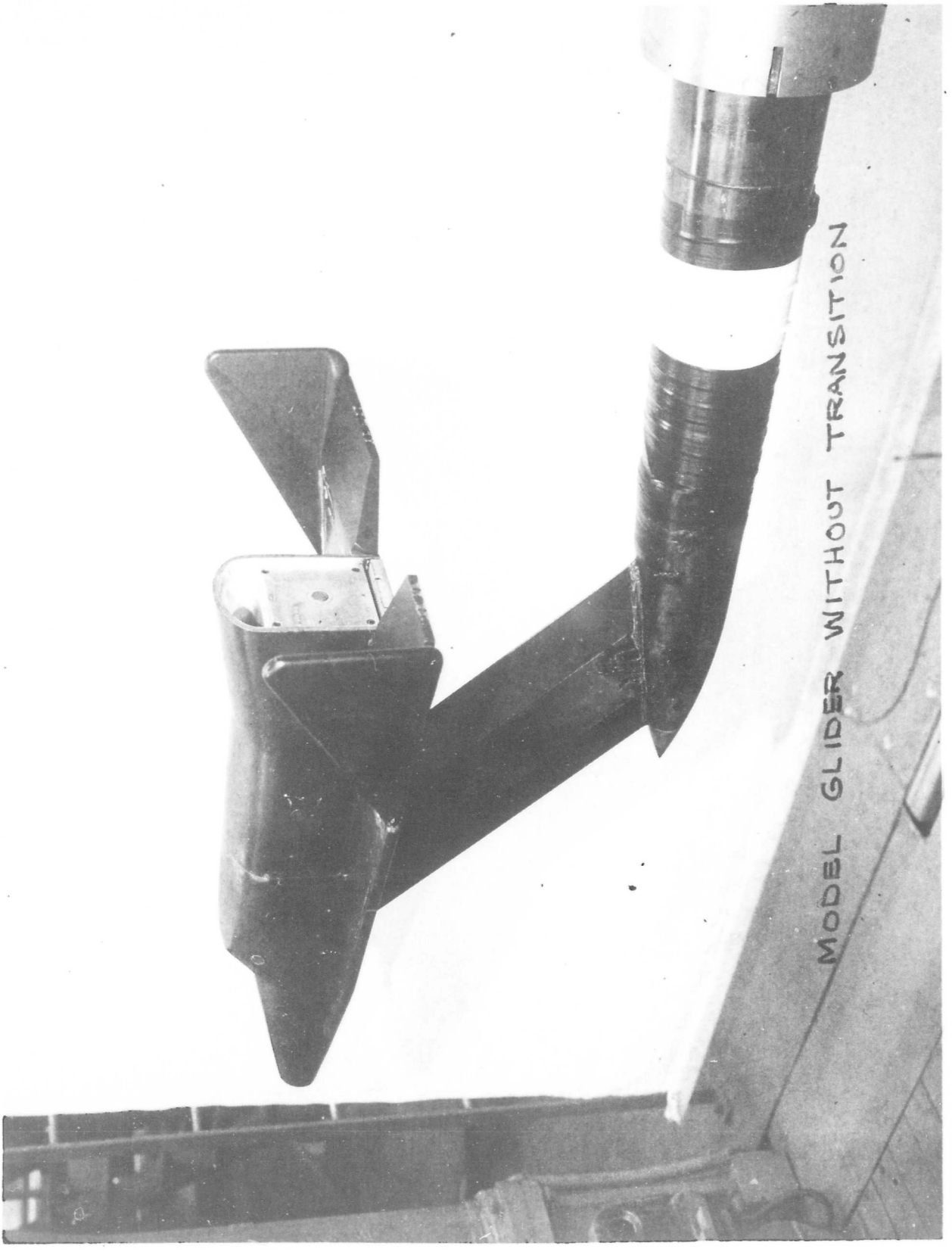
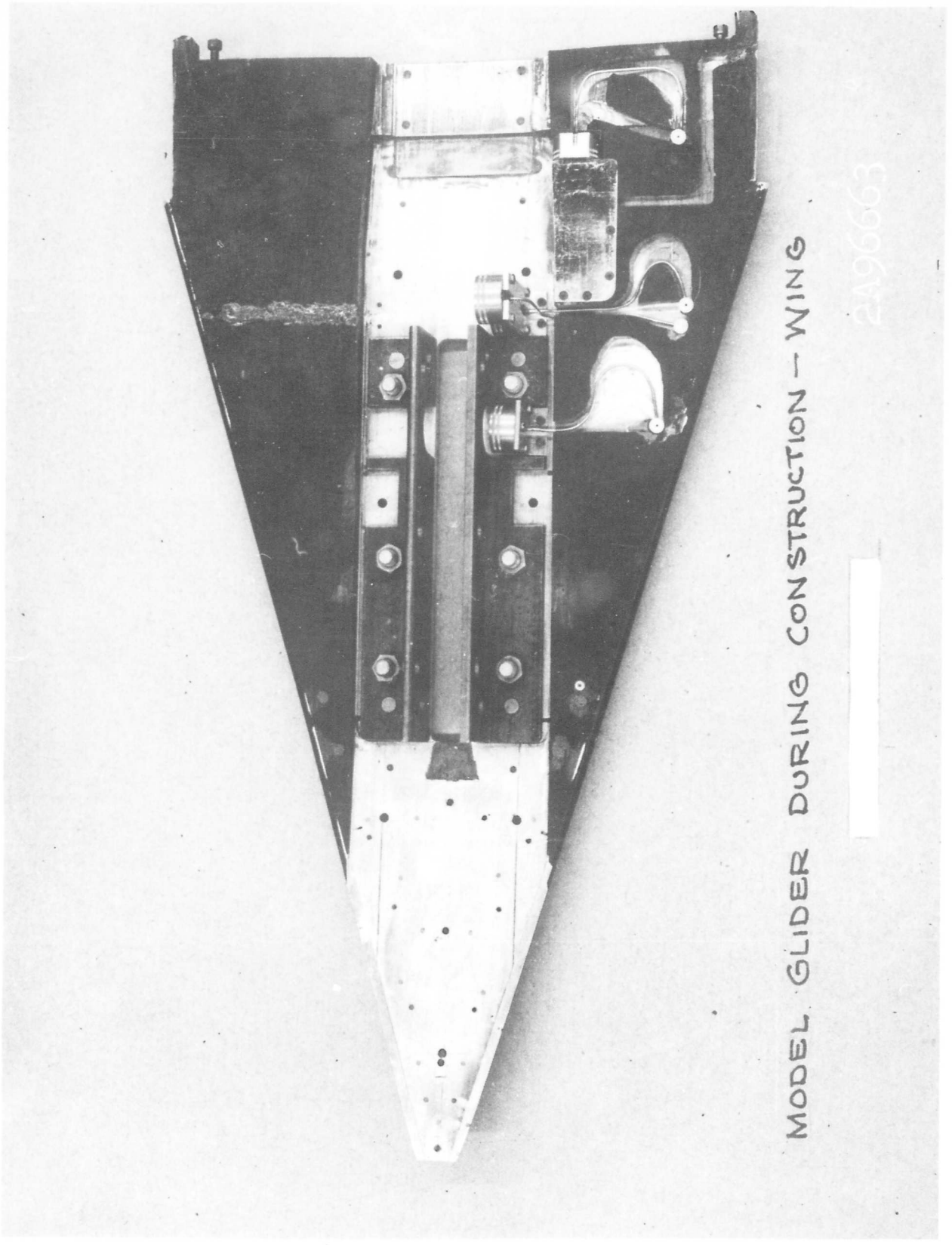


FIGURE 2.0-2

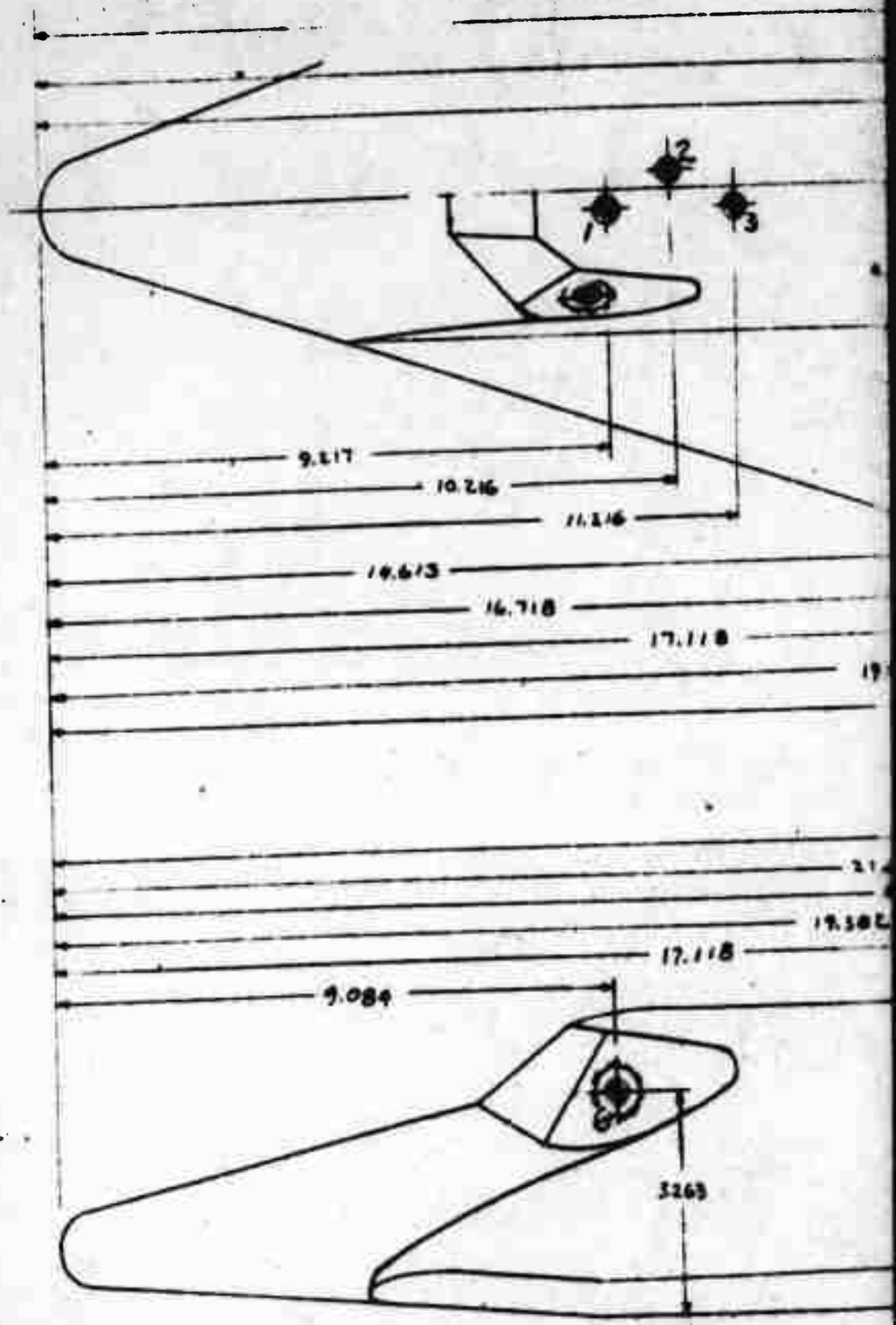


MODEL GLIDER DURING CONSTRUCTION – WING

2A96663

FIGURE 2.0-3

FIGURE 2.0-4



1

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CHECK	W/Russell	5-5-62		
APPR.				
APPR.				

MODEL CONFIGURATION

AD-366P-1

BOEING AIRPLANE COMPANY

AD366 P-1
BSWT 154

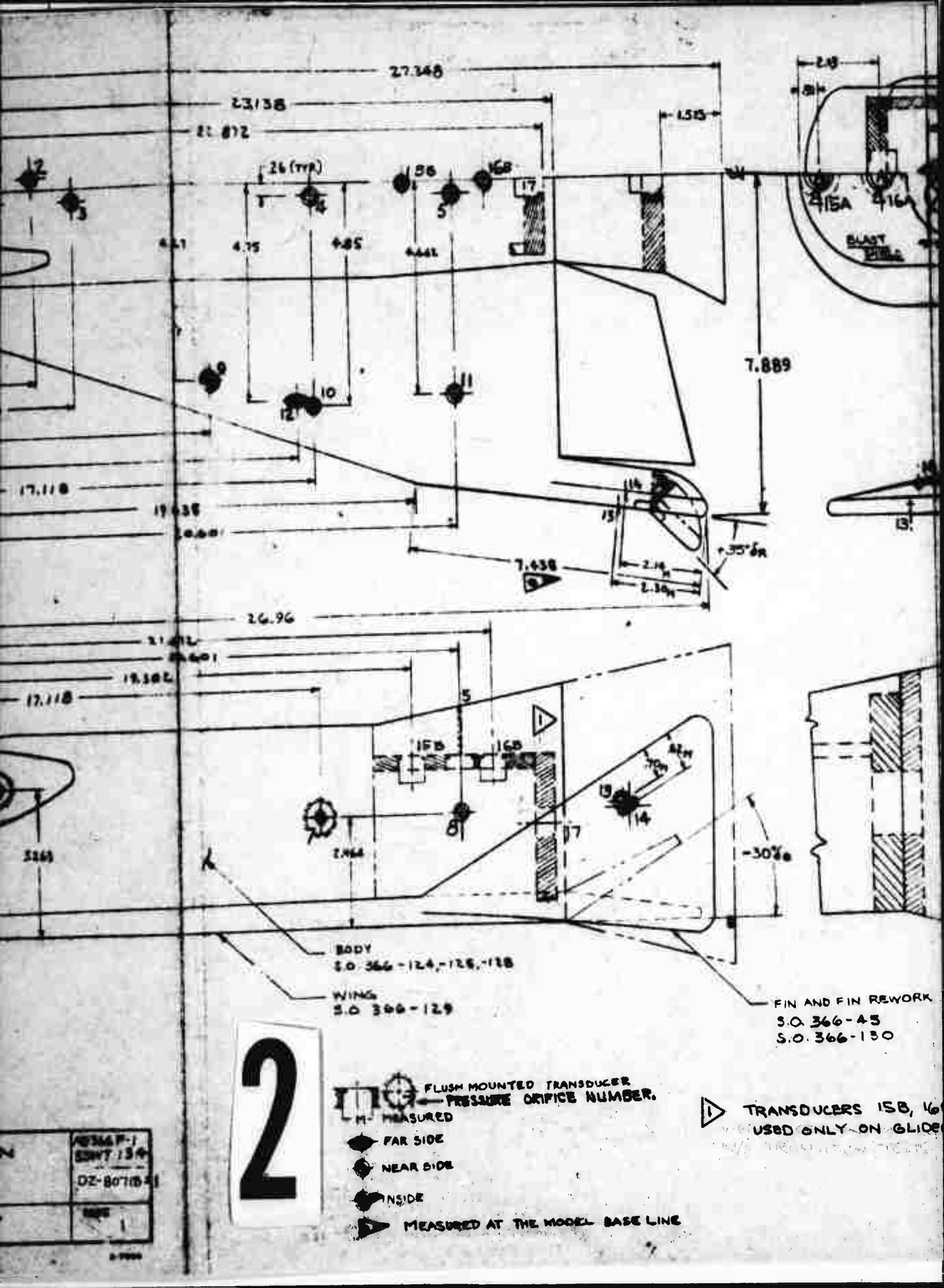
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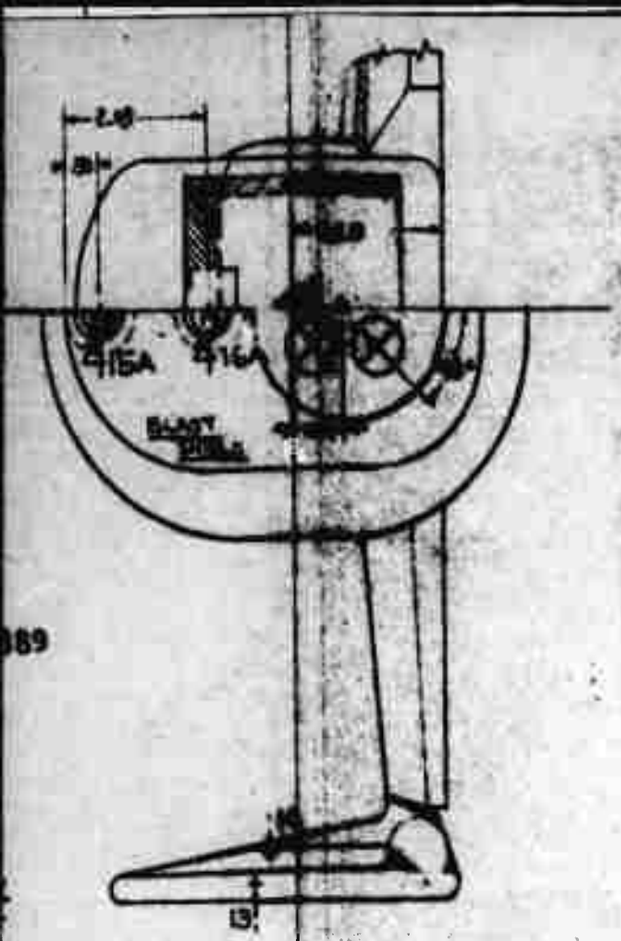
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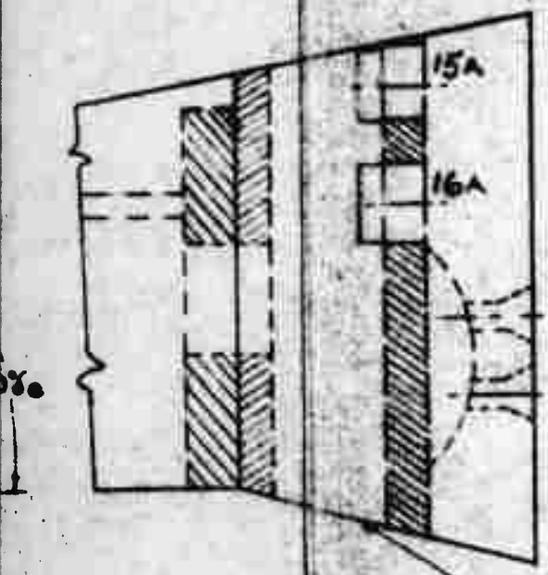
8-7000


27.348
23.138
22.872
26 (TYP)
4.75
4.85
1.515
7.889
17.118
19.638
20.60
7.638
26.96
5.263
2.464
-30°
+35°
BODY
S.O. 366-124,-126,-128
WING
S.O. 366-129
FIN AND FIN REWORK
S.O. 366-45
S.O. 366-130
FLUSH MOUNTED TRANSDUCER
PRESSURE ORIFICE NUMBER.
M- MEASURED
FAR SIDE
NEAR SIDE
INSIDE
MEASURED AT THE MODEL BASE LINE
TRANSDUCERS 15B, 16
USED ONLY ON GLIDE
2



AD-366 P-1
DYNA-SOAR GLIDER MODEL
.066 SCALE
WING AREA = 1.511-SQ FT.
WING SPAN = 14.778-IN.
REF. ASSY. DWG. 25-31319

3



FIN AND FIN REWORK
S.O. 366-45
S.O. 366-130

TRANSITION SECTION ASSY
S.O. 366-126

ANSDUCERS 15B, 16B AND 17,
BD ONLY-ON GLIDER W/O TRANSITION TESTS

FIGURE 2.0-5
D2-80713-1
PAGE 6a

3.0 INSTRUMENTATION

3.1 ACOUSTIC INSTRUMENTATION

The Statham PA208-TC absolute pressure transducer was used to measure fluctuating pressures on the model glider during the wind tunnel test program. These gauges are rated to operate over a pressure range of 0 to 15 psi. The transducer output is quite low and requires two voltage amplifiers to drive the Ampex FR 1100 tape recorder. Typical full scale output voltages (open circuit) ranged from 27-69 millivolts.

The transducer measurement systems were capable of measuring pressures from DC to 5000 cps and obtaining space correlation between pairs of transducers. The transducers were calibrated statically and dynamically and the phase relationship between their output voltages was measured.

3.1.1 Calibration

Static calibrations were performed on the gauges by exposing the transducer diaphram to pressures varying from 0.1 to 30 psia. The Statham gauges were balanced to give zero dc output at normal atmospheric pressure (15 psia). The instrumentation used for this calibration is shown in block diagram form in Figure 3.1-1. This calibration was performed to allow the static pressures on the model to be recorded accurately.

Dynamic calibrations were performed on the transducers by utilizing a single frequency pressure coupler calibration technique. The essential items of the calibrator consists of: (1) a wedge shaped chamber which couples the transducers to an acoustic pressure source, (2) a monitor microphone (Altec Type 21BR180) which serves as a secondary standard and monitors the cavity pressure field, (3) a University ID 40 acoustic driving unit, and (4) a Statham transducer (probe attached for wing and fin locations) to be calibrated. The sound field produced in the pressure coupler (140 db) is maintained uniform from 40 to above 5000 cps with a compressor control circuit.

A block diagram of the dynamic calibration system is shown in Figure 3.1-2. The dynamic calibrations were performed with the transducers mounted either with their diaphrams flush or with their respective probes mounted flush with the wedge coupler cavity wall. Figures 3.1-3 and 3.1-4 illustrates the various types of probes and their component parts.

The phase relationship of the transducers was measured by using the acoustic calibration coupler, two transducers, their power supplies, amplifiers, tape recorder, oscilloscope and a phase-shifter. The two gauges were mounted in the coupler at opposite sides, and exposed to the coupler sound field. The output voltages of the Statham gauges were passed through their repsective amplifiers and recorded on the FR-1100, tape recorder. For the playback of these

signals, one transducer (the reference) is fed directly into one axis of the oscilloscope, the other passes through the phase-shifter and then to the other axis of the oscilloscope. With both signals being fed into different axes of the oscilloscope, a Lissajous figure will be produced. The phase-shifter is adjusted until the Lissajous figure indicated zero degree phase shift between the two signals. The phase angle is then read directly from the phase-shifter. A block diagram of this instrumentation is shown in Figure 3.1-5. Figure 3.1-6 shows two transducer systems with probes being phase matched while installed in the wedge pressure coupler.

Also calibrated prior to the testing program was a portable field calibrator which produced a sound pressure level of 145 db at 200 cps when closely coupled to a glider transducer. The field calibrator was used to calibrate the glider model transducer measurement systems during the test program.

Preliminary calibrations and data obtained from vibration shake tests indicated that the average transducer resonance occurred at 5600 cps and had very low damping (see Section 3.2). Therefore, a low-pass filter was incorporated into the first pre-amplifier's output. Figure 3.1-7 shows a schematic of the pre-amplifier and filter circuit and the frequency response of both units. The dynamic calibrations and the phase checking were measured through this pre-amplifier and filter.

Static calibrations were performed on 15 of the PA 208 TC 15-350 gauges and on 2 of the PA 222 TC 15-350 gauges. The plots of the static calibrations are shown in Figures 3.1-8 through 3.1-25.

Dynamic end-to-end calibrations were performed on all 17 gauges and their associated electronics used for the test. The results are plotted on Figures 3.1-26 through 3.1-43. The gauges with probe tubes had the characteristic peaks and valleys in their response curves due to the acoustic resonances of the probes.

The results of the phase relationship measurements are tabulated in Figures 3.1-44 and -45. The phase shift was measured through the entire system from transducer through the tape recorder playback.

3.1.2 Testing

The basic instrumentation used for each track of recorded acoustical information is shown in block diagram form in Figure 3.1-46. The 32 channel oscillograph shown in Figure 3.1-46 was calibrated to provide a "quick look" at the acoustic data taken during the test program. In addition, the oscillographic data was used to select the tunnel test conditions for detail study. Acoustic pressure calibrations were performed on the model glider transducers just prior to, during, and after the wind tunnel test programs by utilizing the portable field calibrator. These field calibrations served to determine data channel sensitivity changes and as a recorded calibration tone for data reduction. Figure 3.1-47 illustrates how the field calibrator was used on the wind tunnel model configuration.

3.1.3 Data Reduction

The data reduction was performed by using 1/3 octave band filters and plotting the data on a B&K graphic level recorder. Figure 3.1-48 is a block diagram of the data reduction system. The data reduction was performed in the following manner. First, the calibration signal (145 db at 200 cps) recorded on tape during the test program was used to establish a reference sound pressure level on the B & K graphic record. Then the recorded tape data was filtered and a permanent record was obtained on the B & K graphic level recorder. These levels were tabulated and system frequency response correction were applied to give corrected sound pressure levels. The system corrections applied includes the transducer, its probe tube if used, the first pre-amp and low pass filter, and the tape recorder pre-amplifier. The tape recorder and playback system have no corrections over this frequency range.

The space correlation coefficients, (R), were obtained by using the sum and difference amplifier method. A block diagram of the method is shown in Figure 3.1-49.

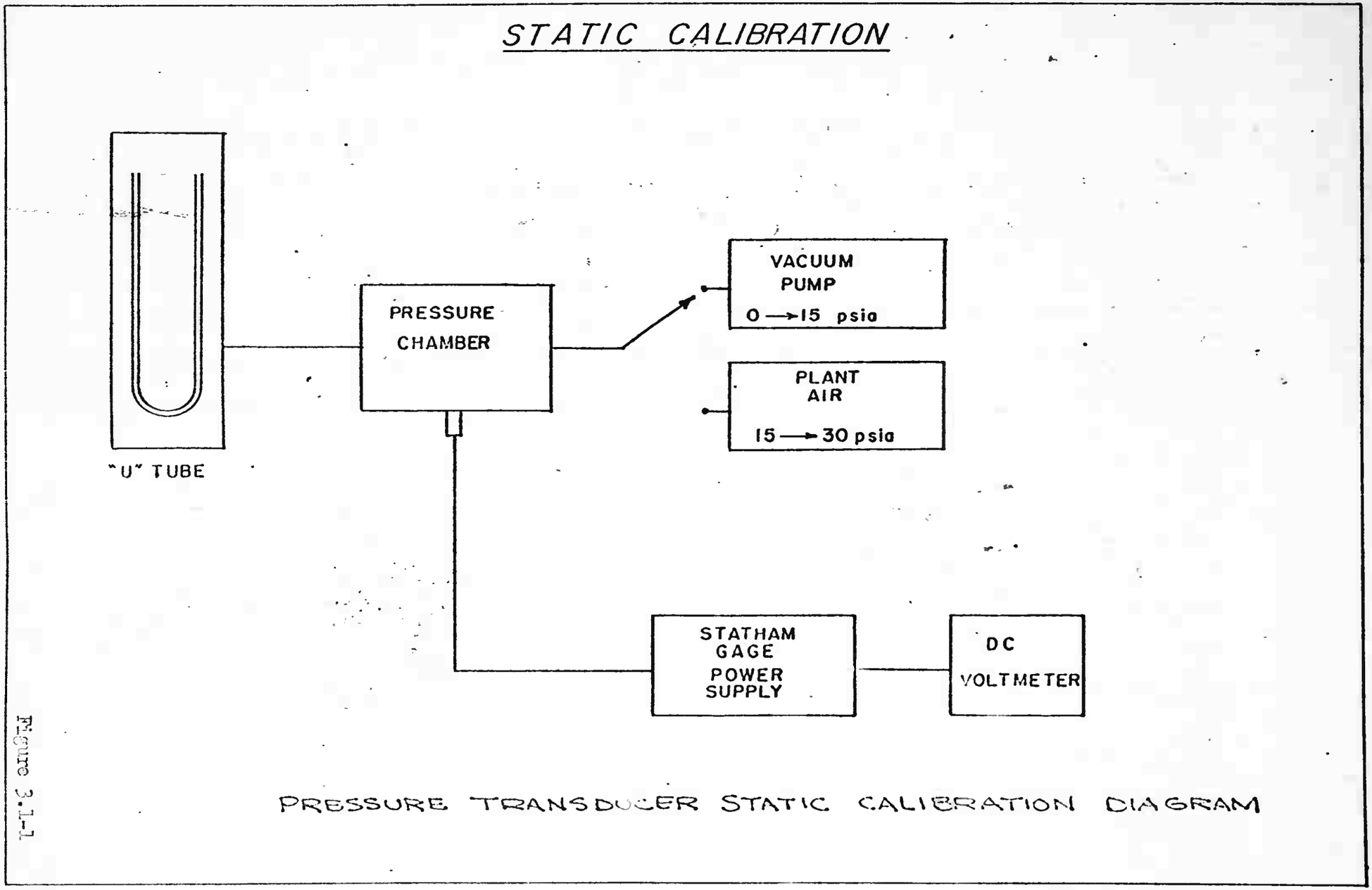


Figure 3.1-1

PRESSURE TRANSDUCER STATIC CALIBRATION DIAGRAM

PRESSURE TRANSDUCER DYNAMIC CALIBRATION DIAGRAM

Figure 3.1-2

PRESSURE PROBES USED DURING TEST
WESTCOTT
RULER
12
11
14
13
5

FIGURE 3.1-3

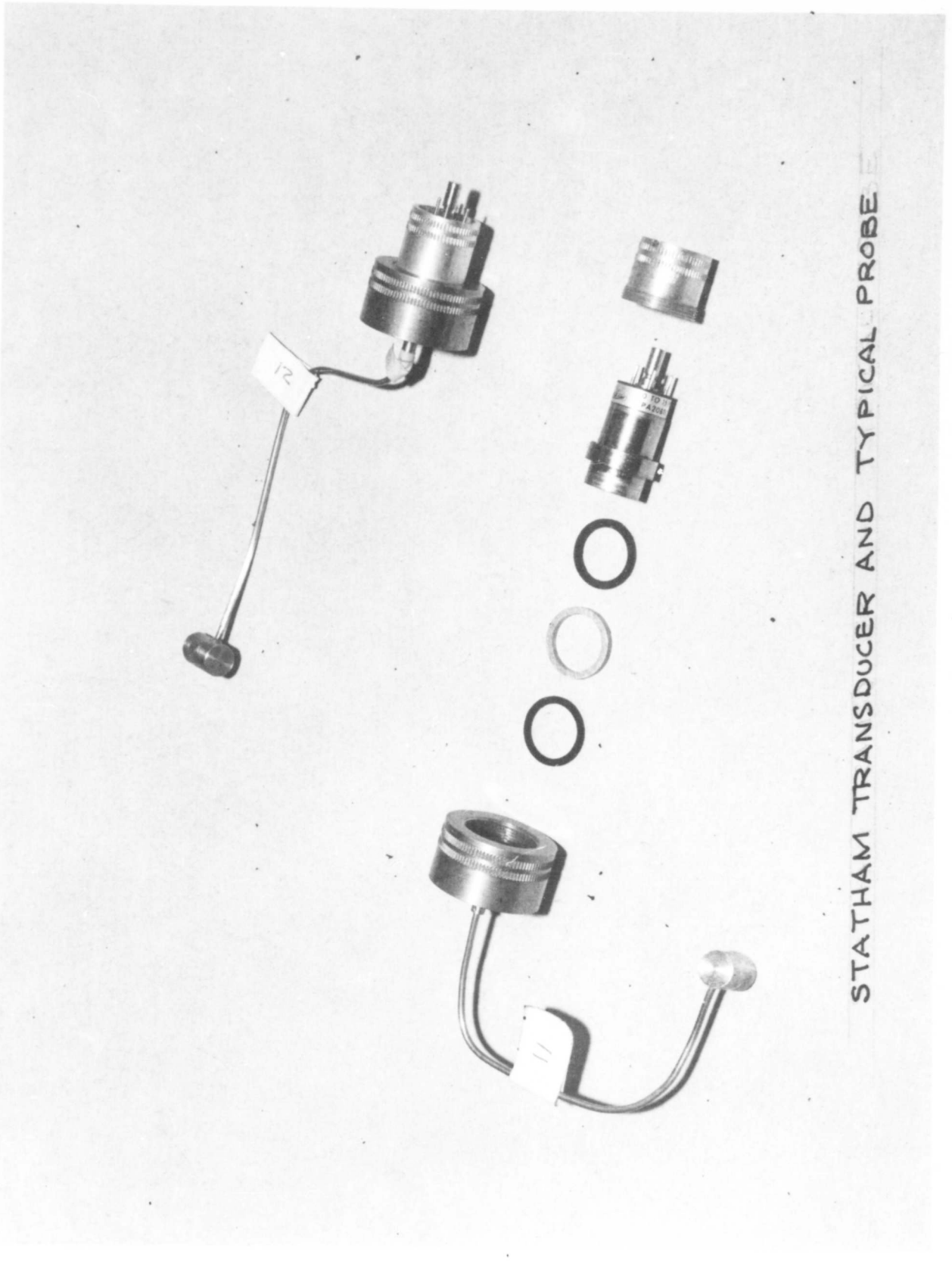


FIGURE 3.1-4

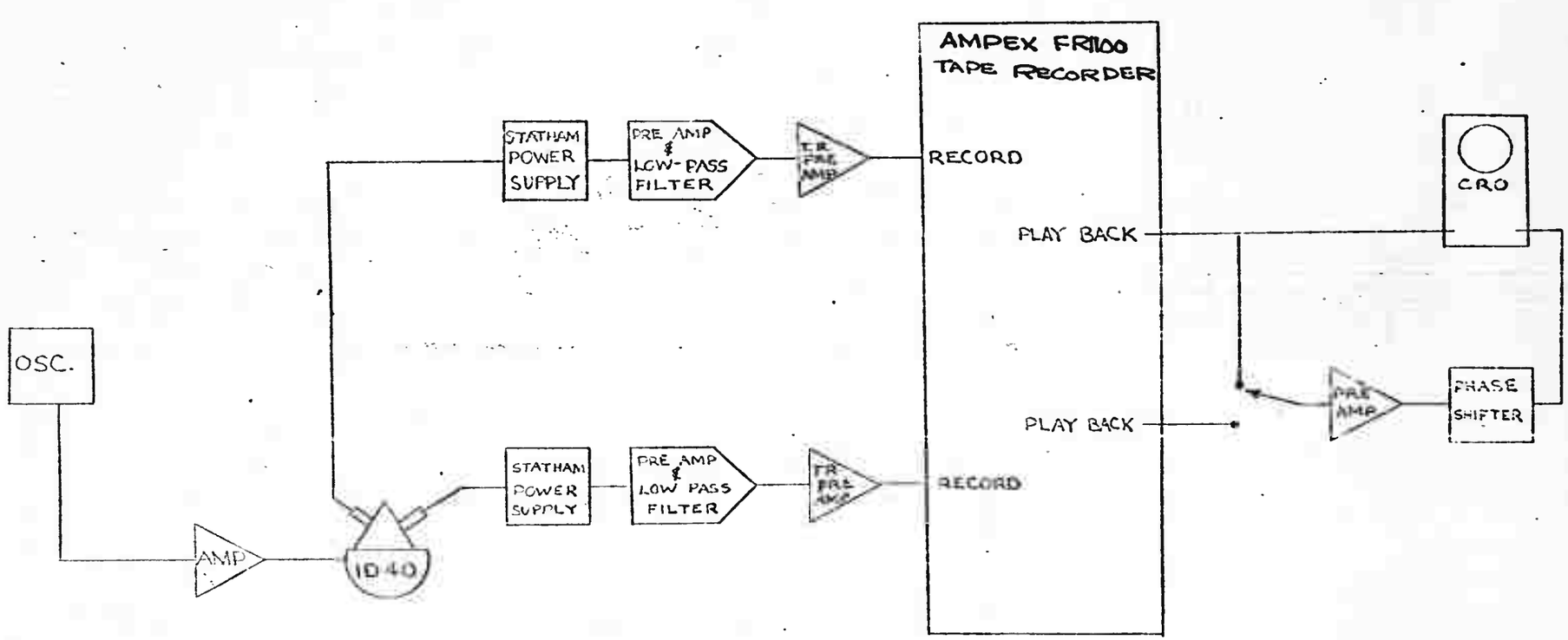


Figure 3.1-5

PHASE CHECKING NETWORK

PRESSURE COUPLER CALIBRATOR

FIGURE 3.1-6

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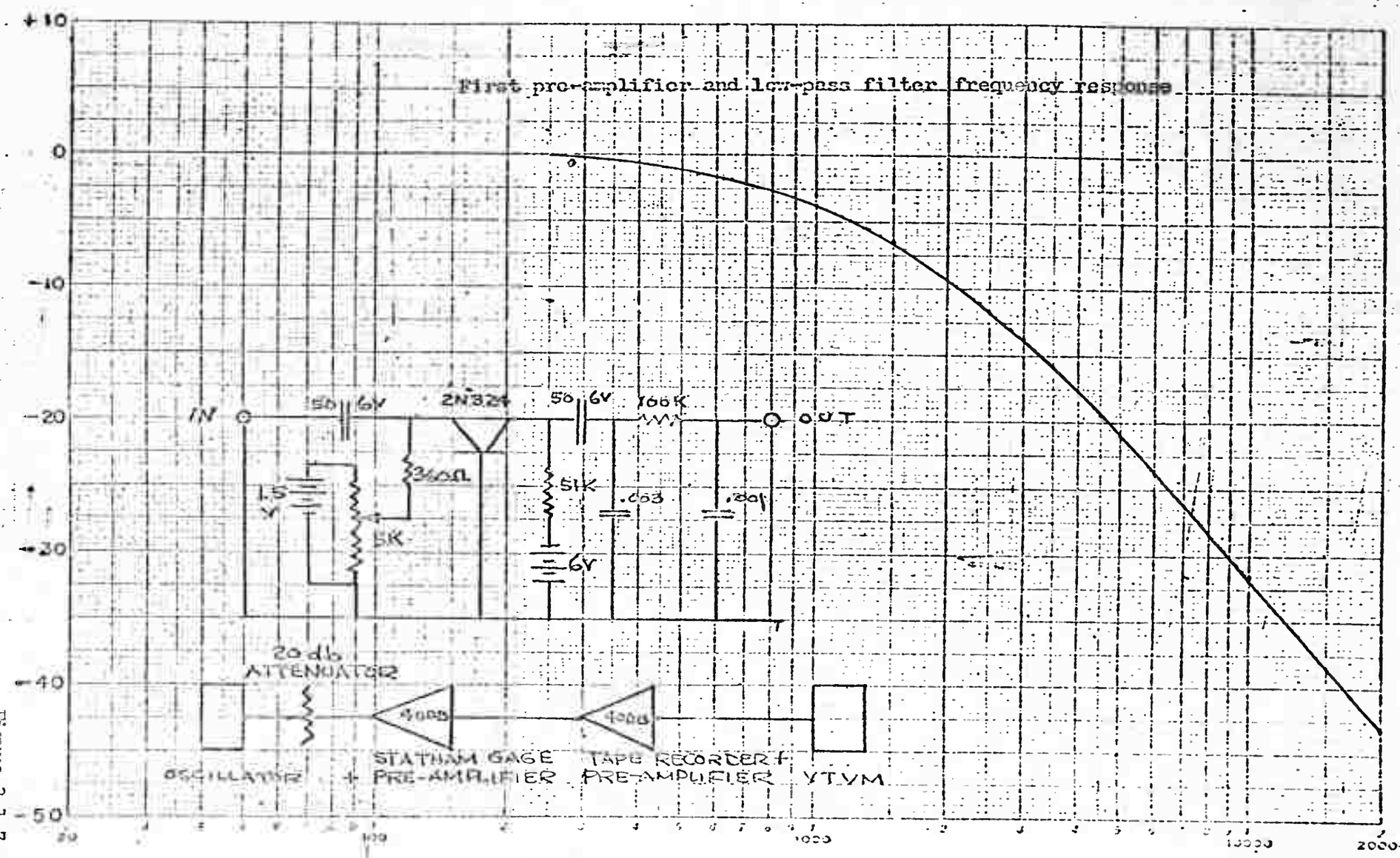
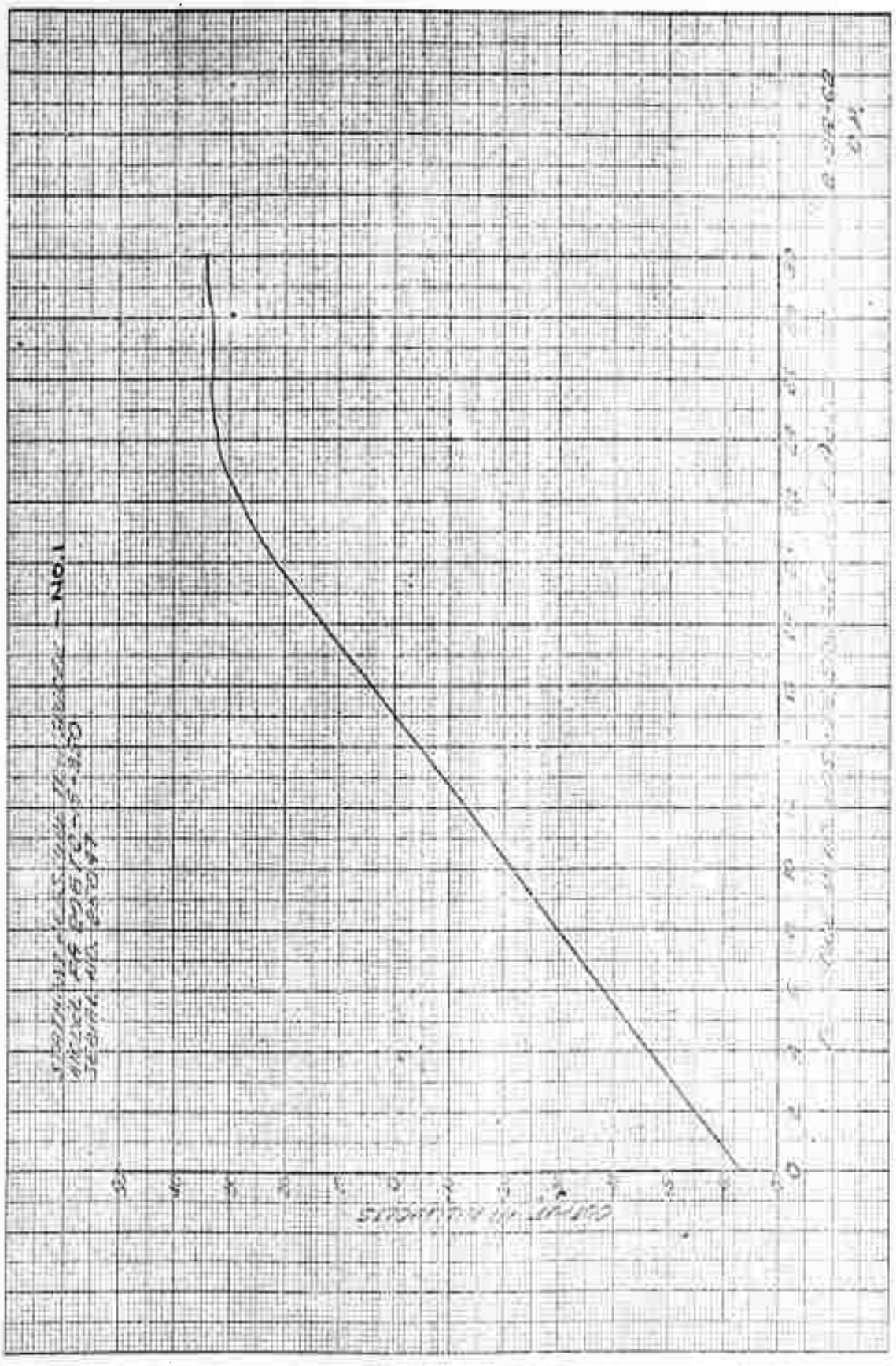


Figure 3.1-7
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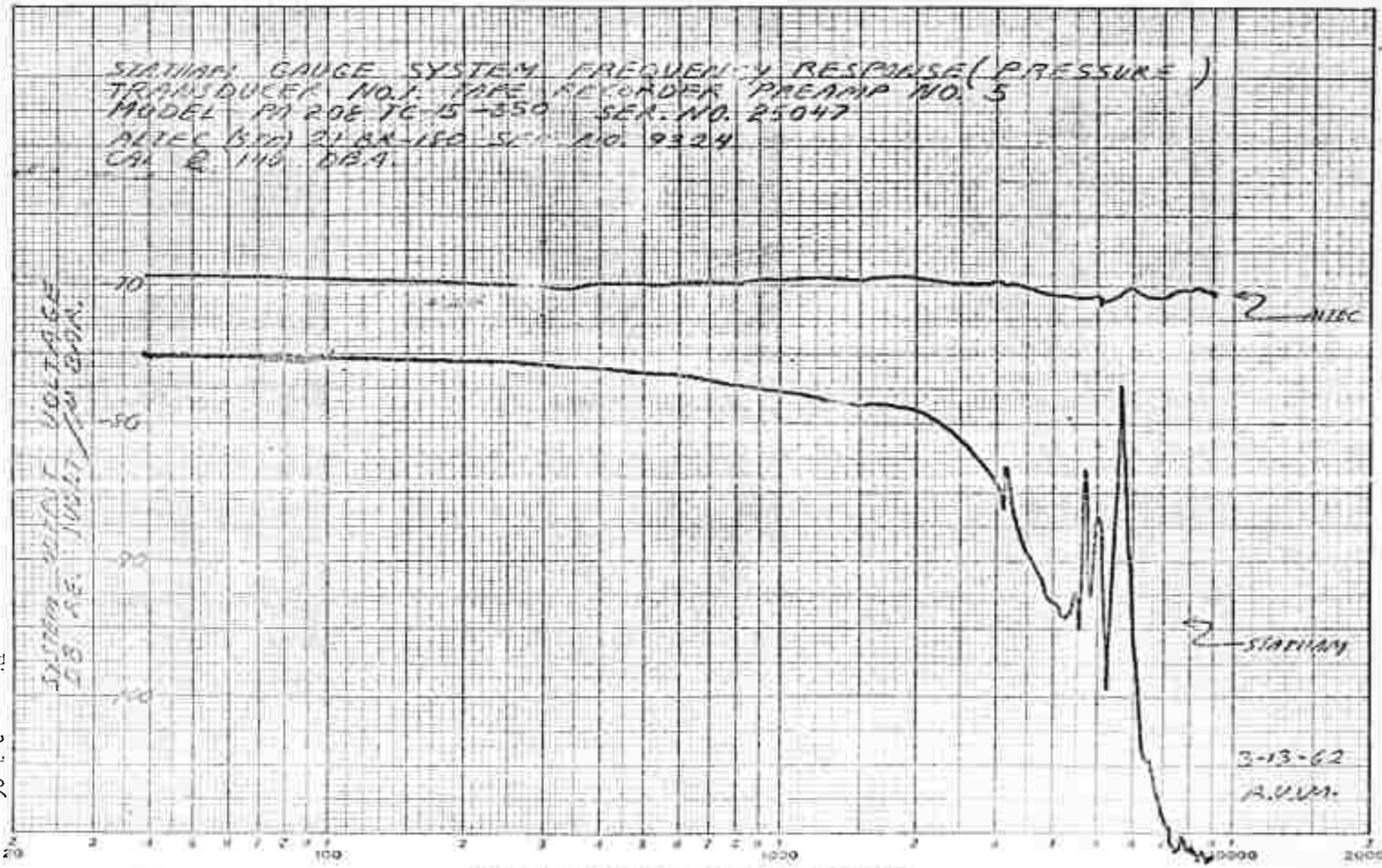


Figure 3.1-26
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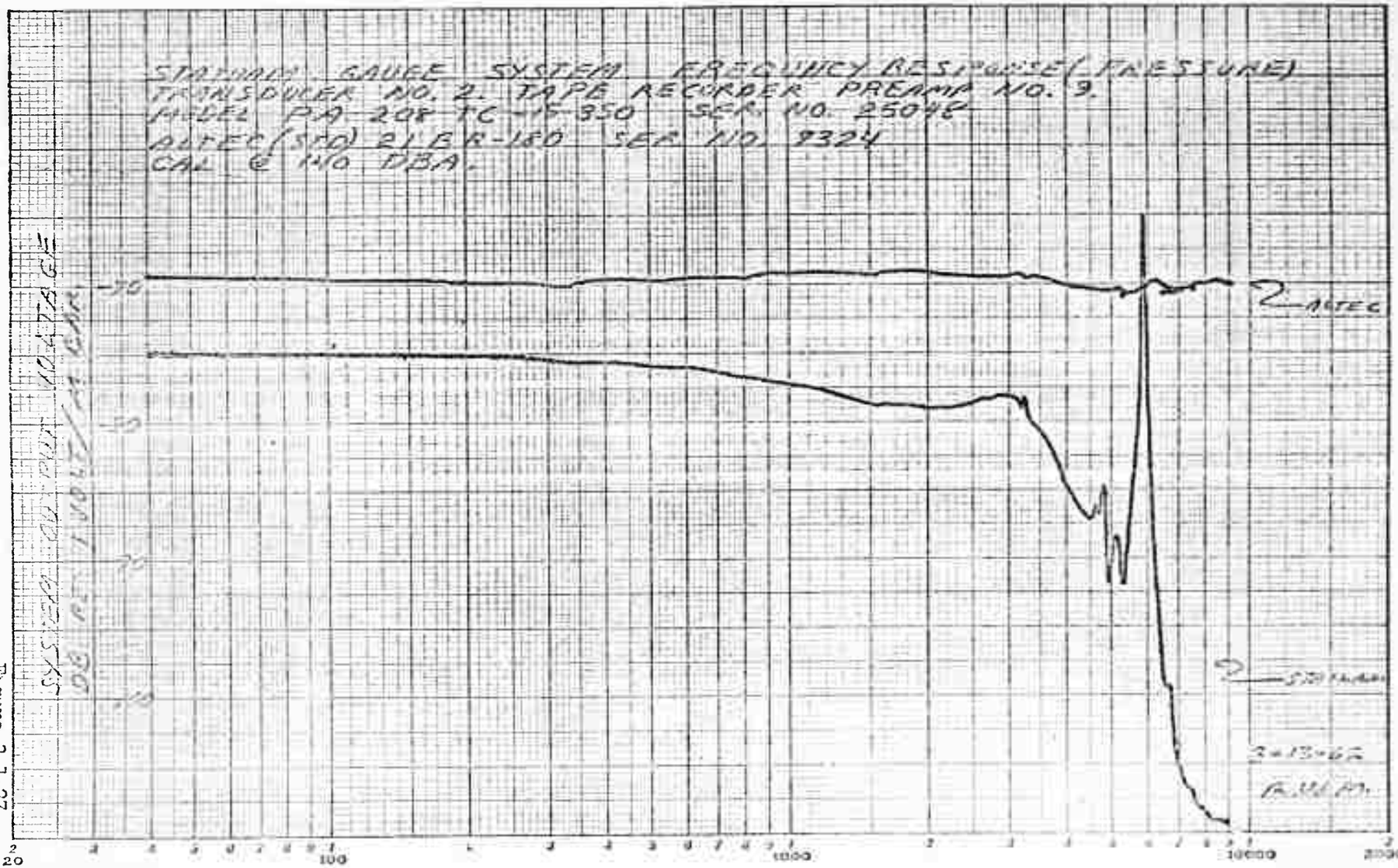


Figure 3.1-27
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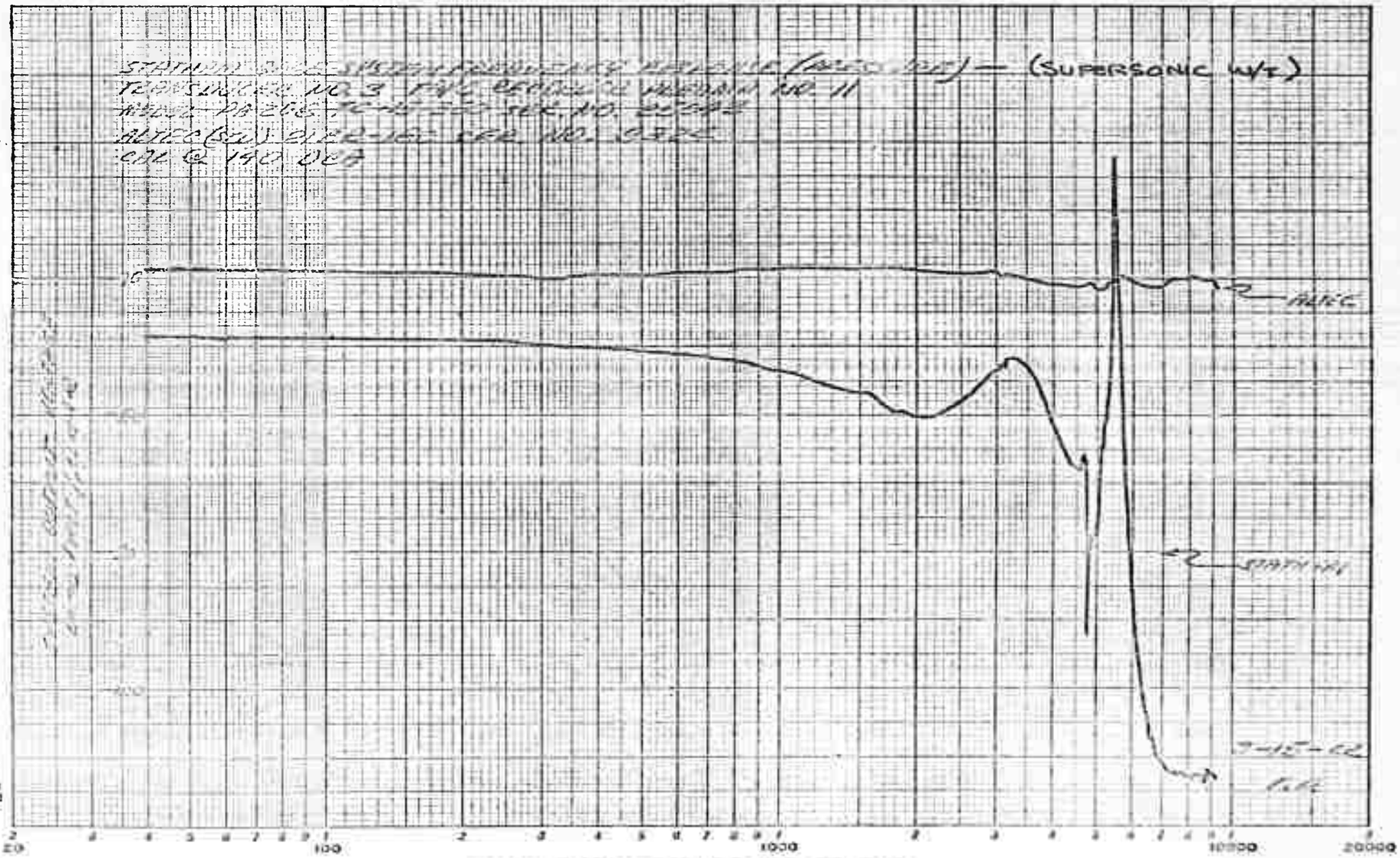
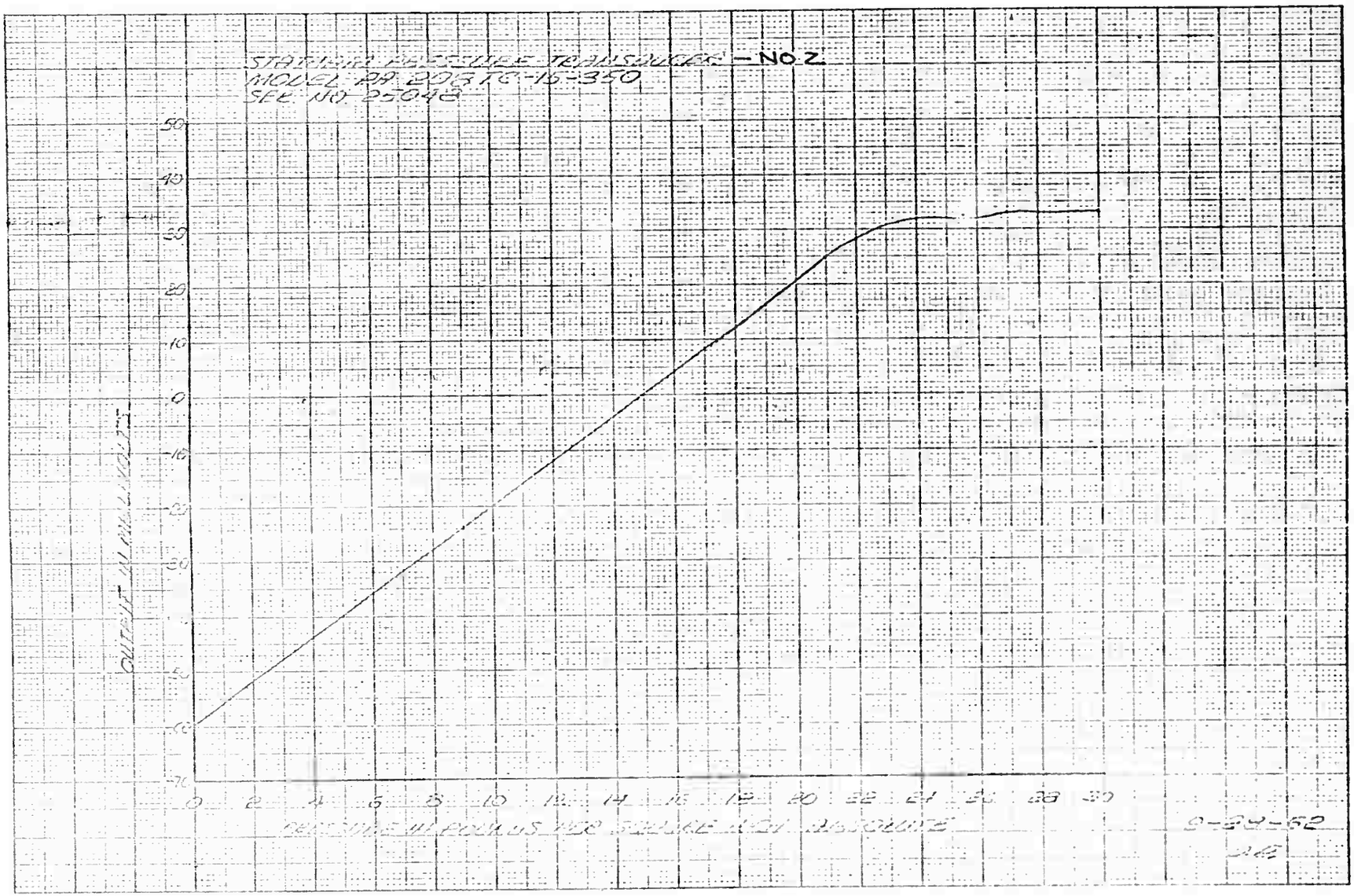


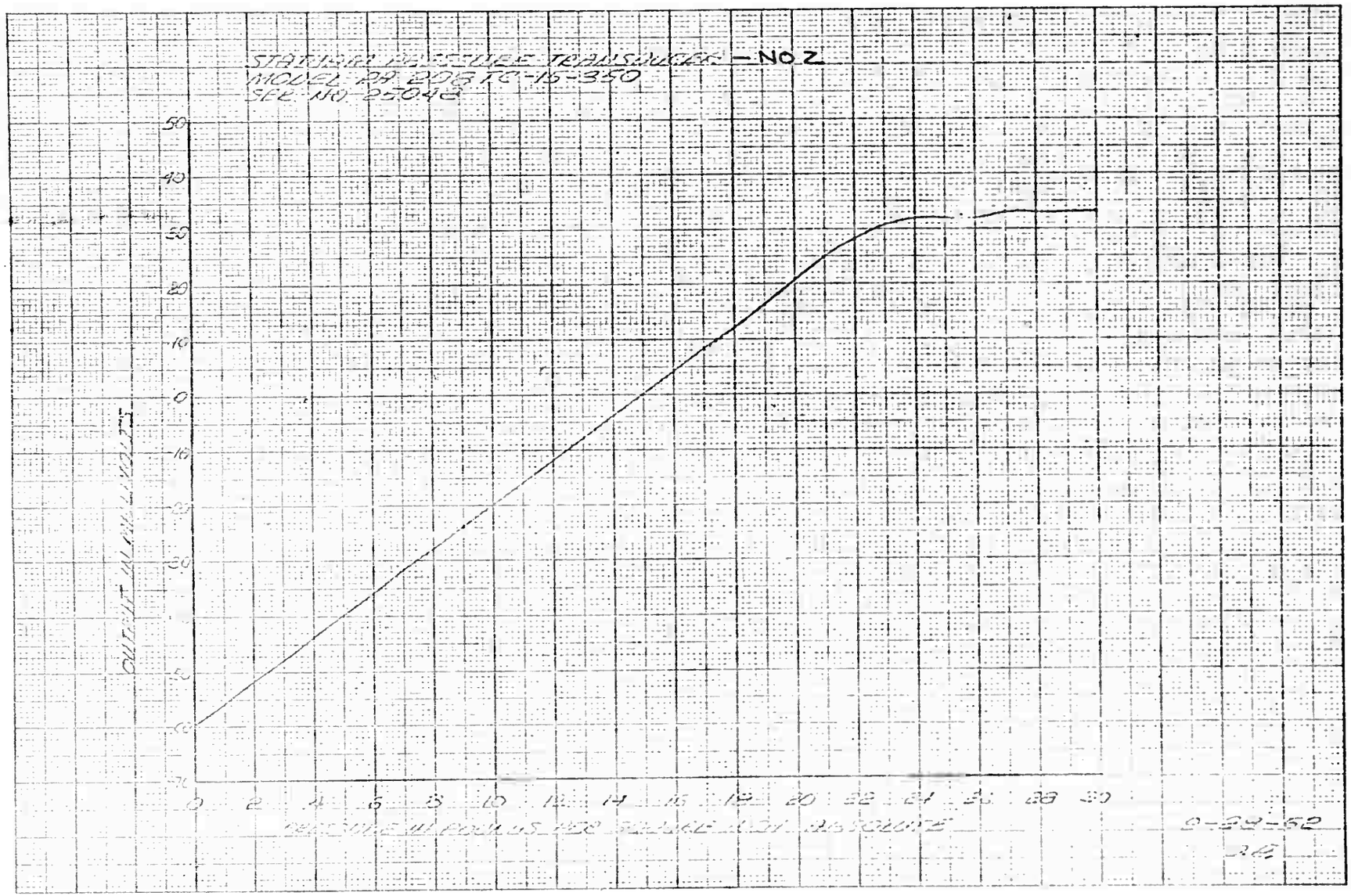
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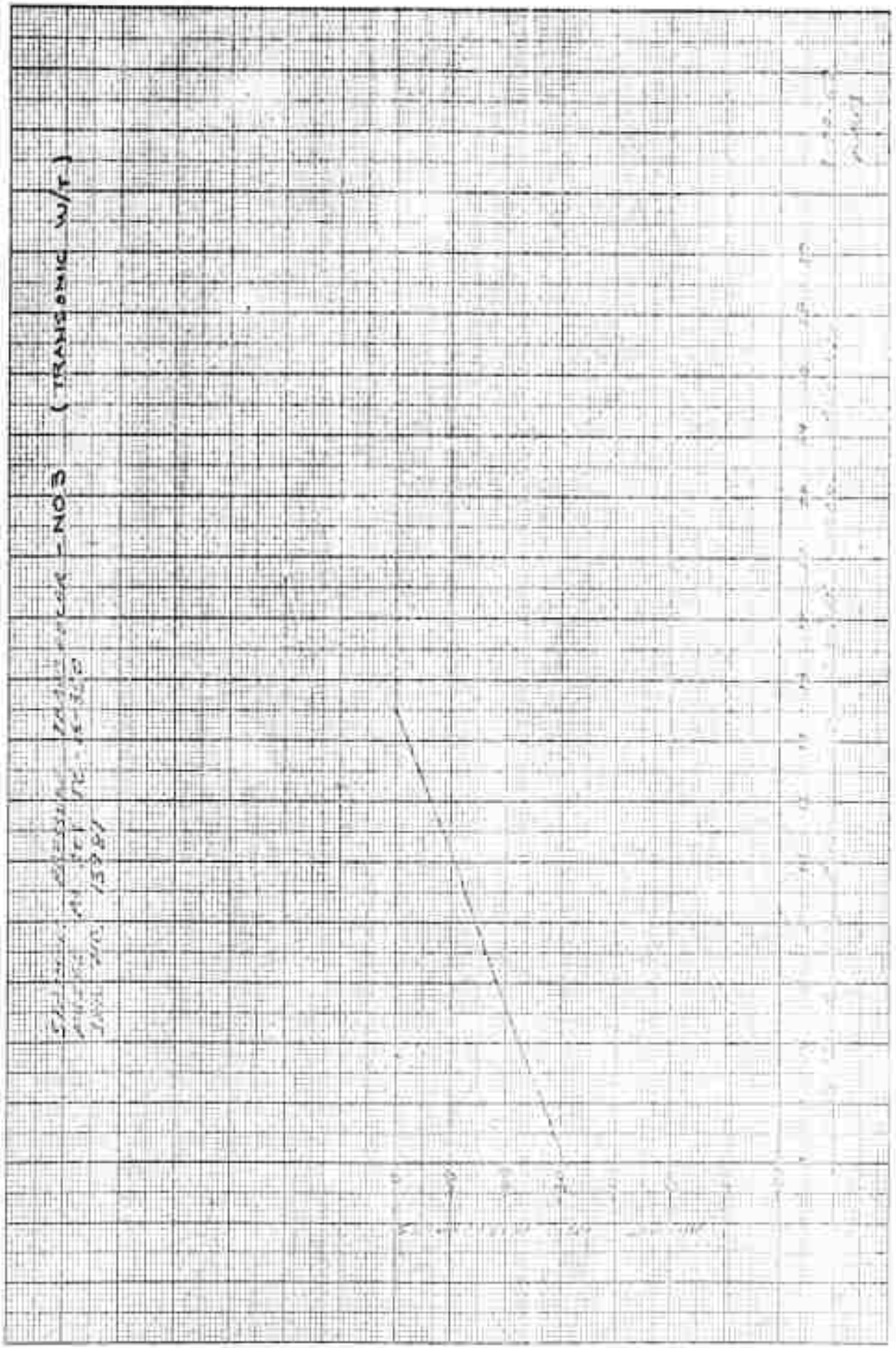
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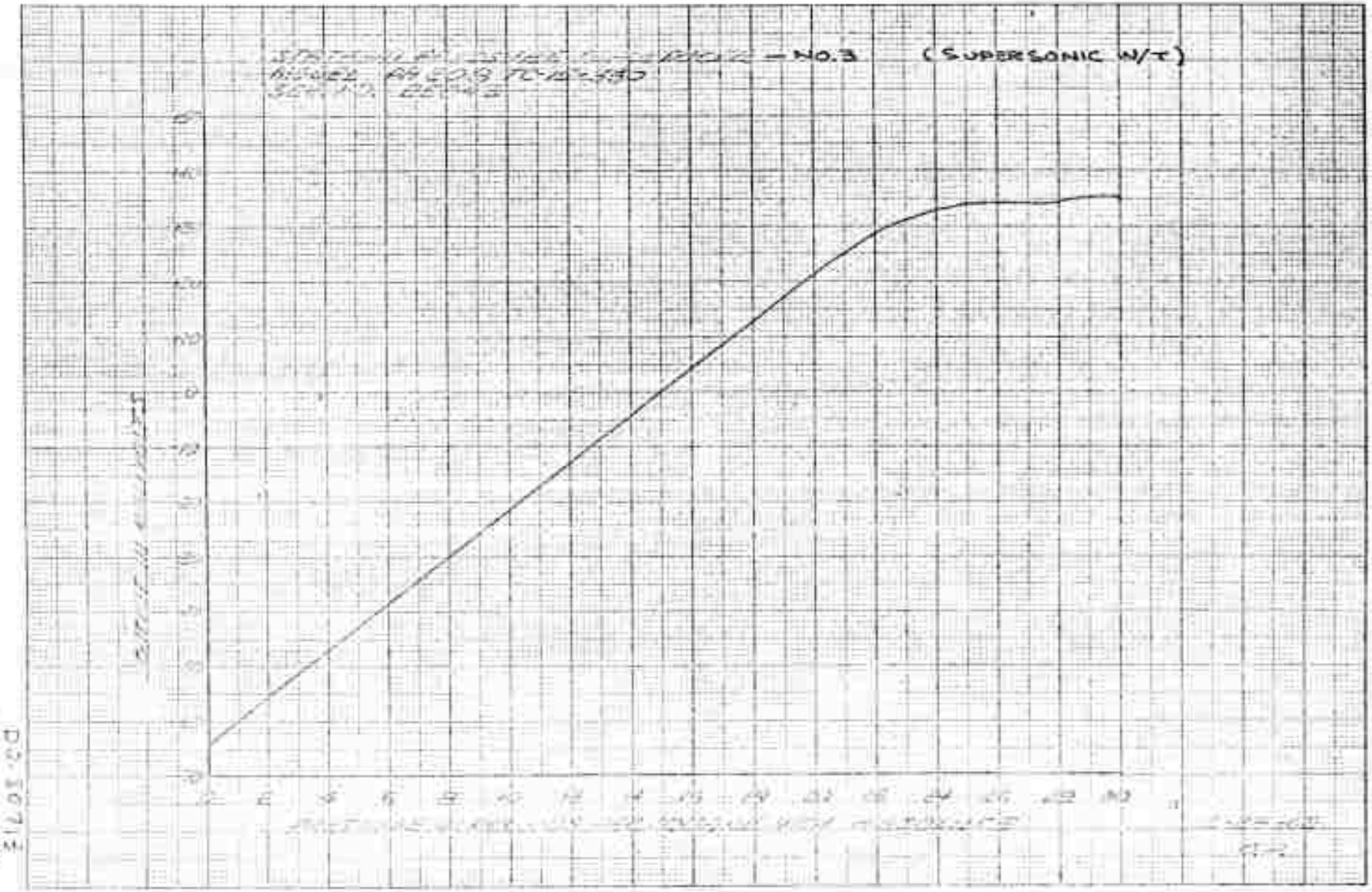


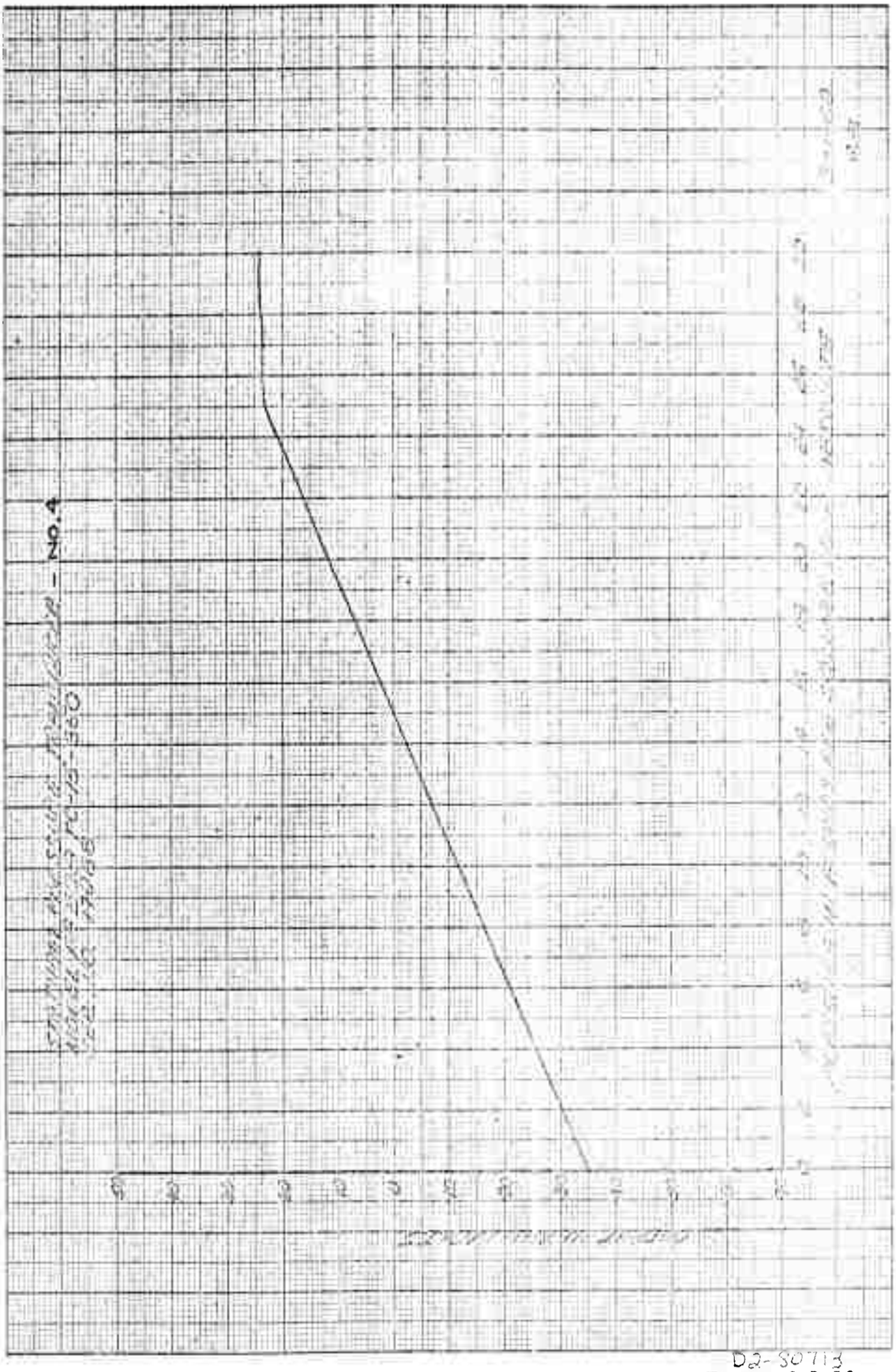
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Figure 3.1-12
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Figure 3.2-13
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NO. 313 MILLIMETERS. 100 BY 220 DIVISIONS.
CODEX BOOK COMPANY, INC. NORWOOD, MASSACHUSETTS.
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STATIONARY PRESSURE FROM DUCT — NO. 6 (TRANSONIC W/I)
MODEL PA 302 PC-15-150
SAN. NO. 2765

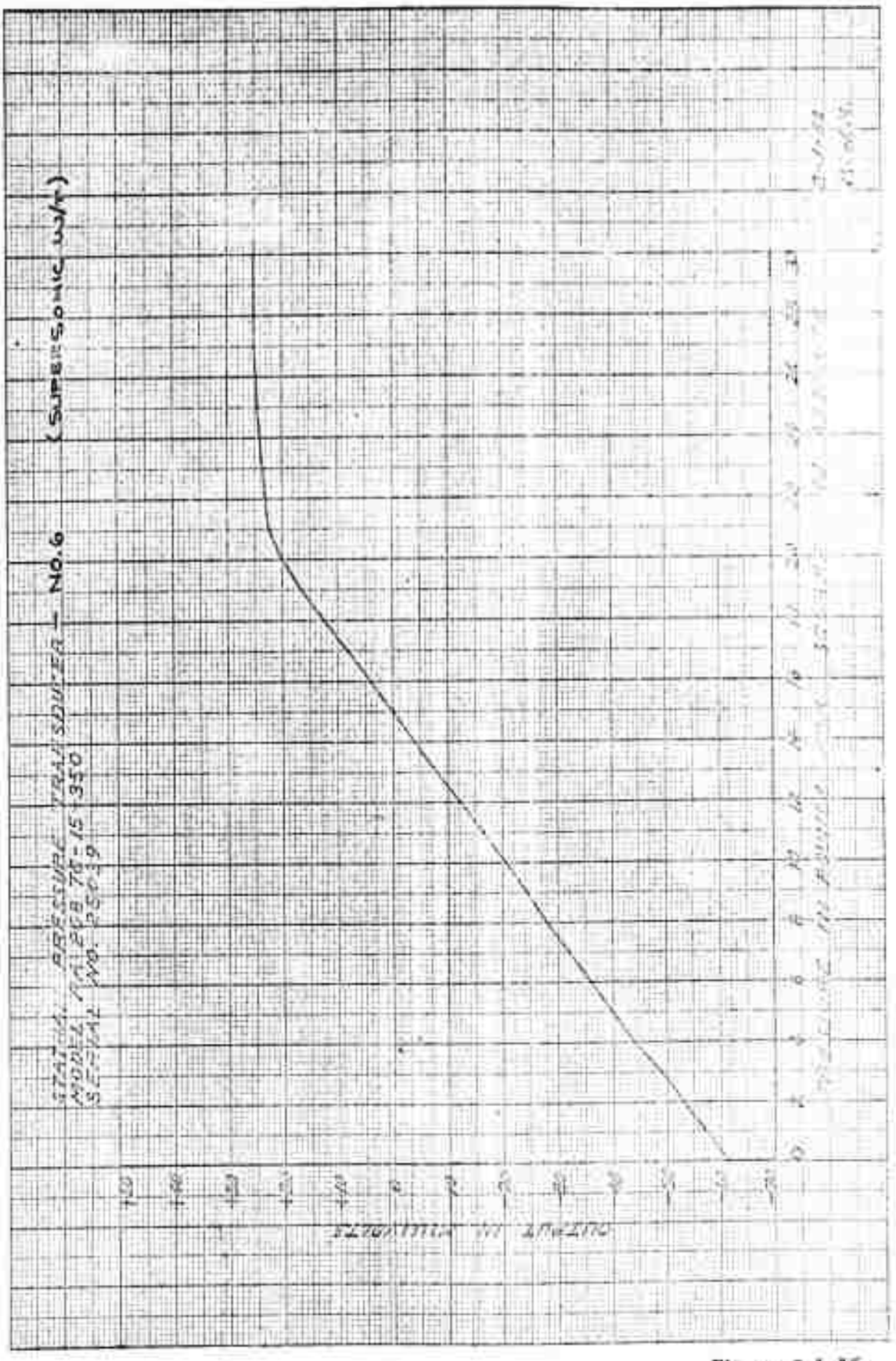


Figure 3.1-15
Page 24
D2-80713

Figure 3.1-16
Page 25

D2-80718

NO. 319 MILLIMETERS. 100 BY 200 DIVISIONS.

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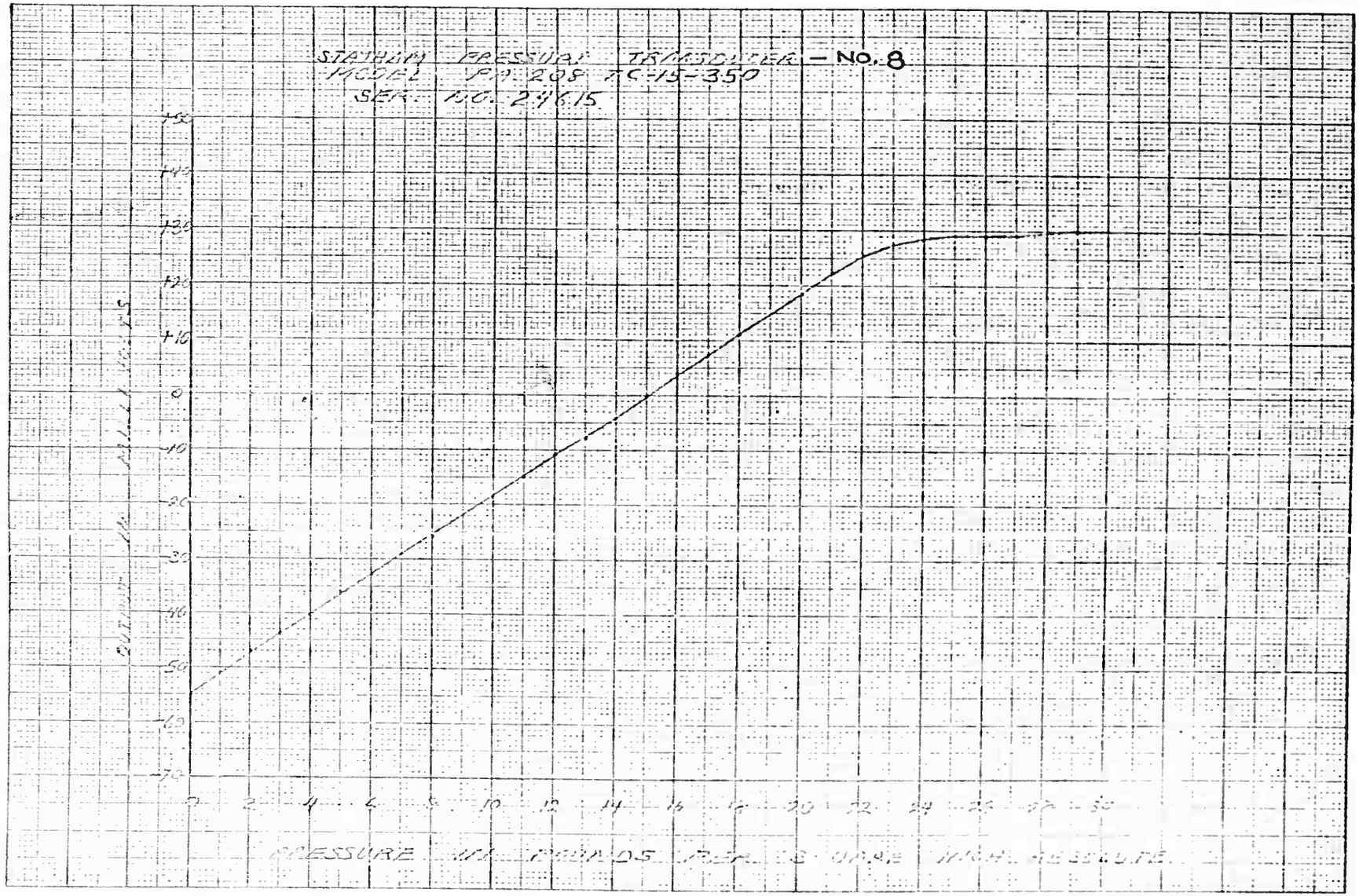


Figure 3.1-17
Page 26 of 80713

Figure 3.1-18
Page 27

D2-80713

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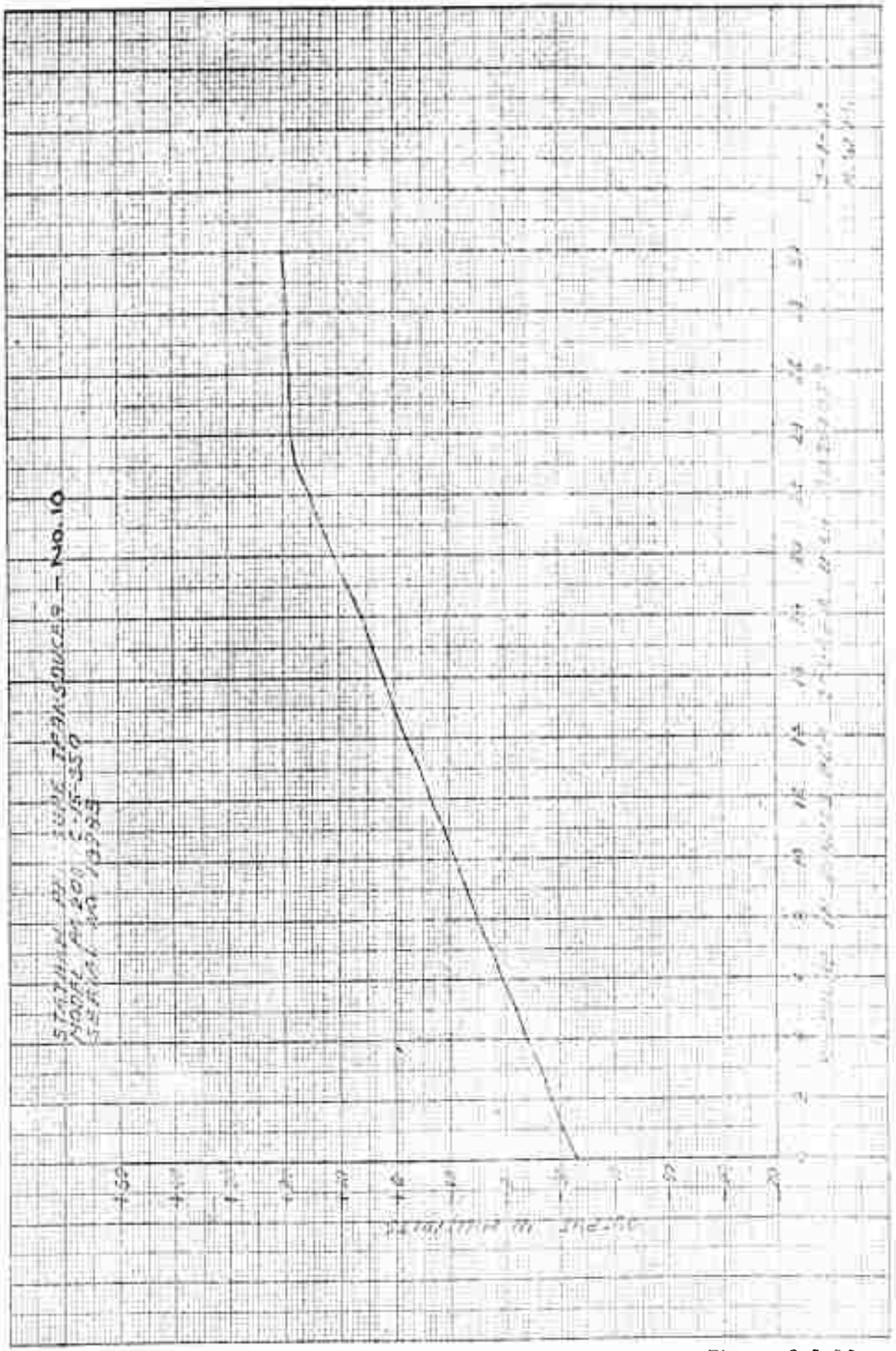


Figure 3.1-19
Page 28

D2-80713

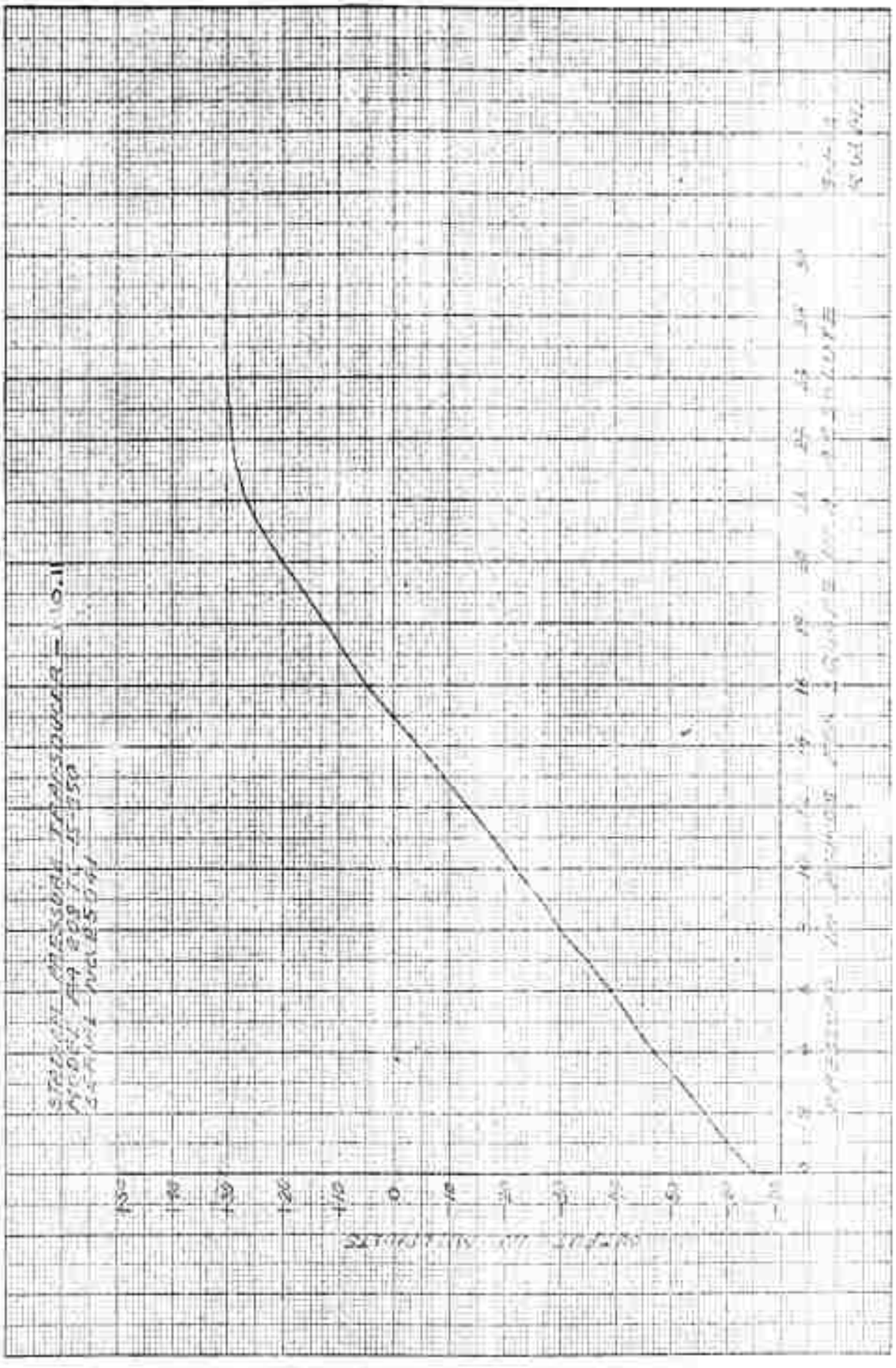


Figure 3.1-20
Page 29

Figure 3.1-21
Page 30

D2-30713

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NO. 510 MILLIMETERS, 100 BY 200 DIVISIONS.

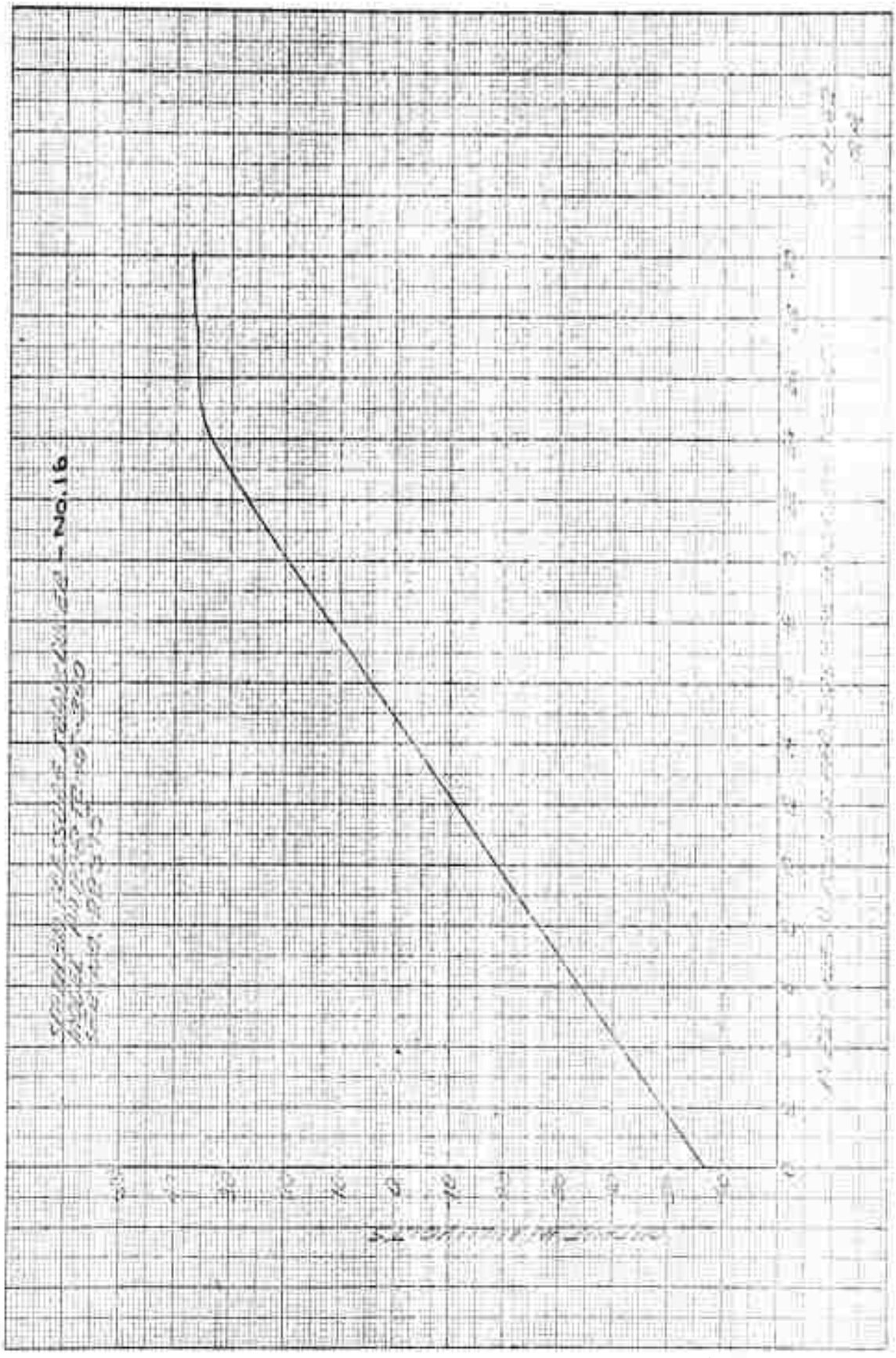
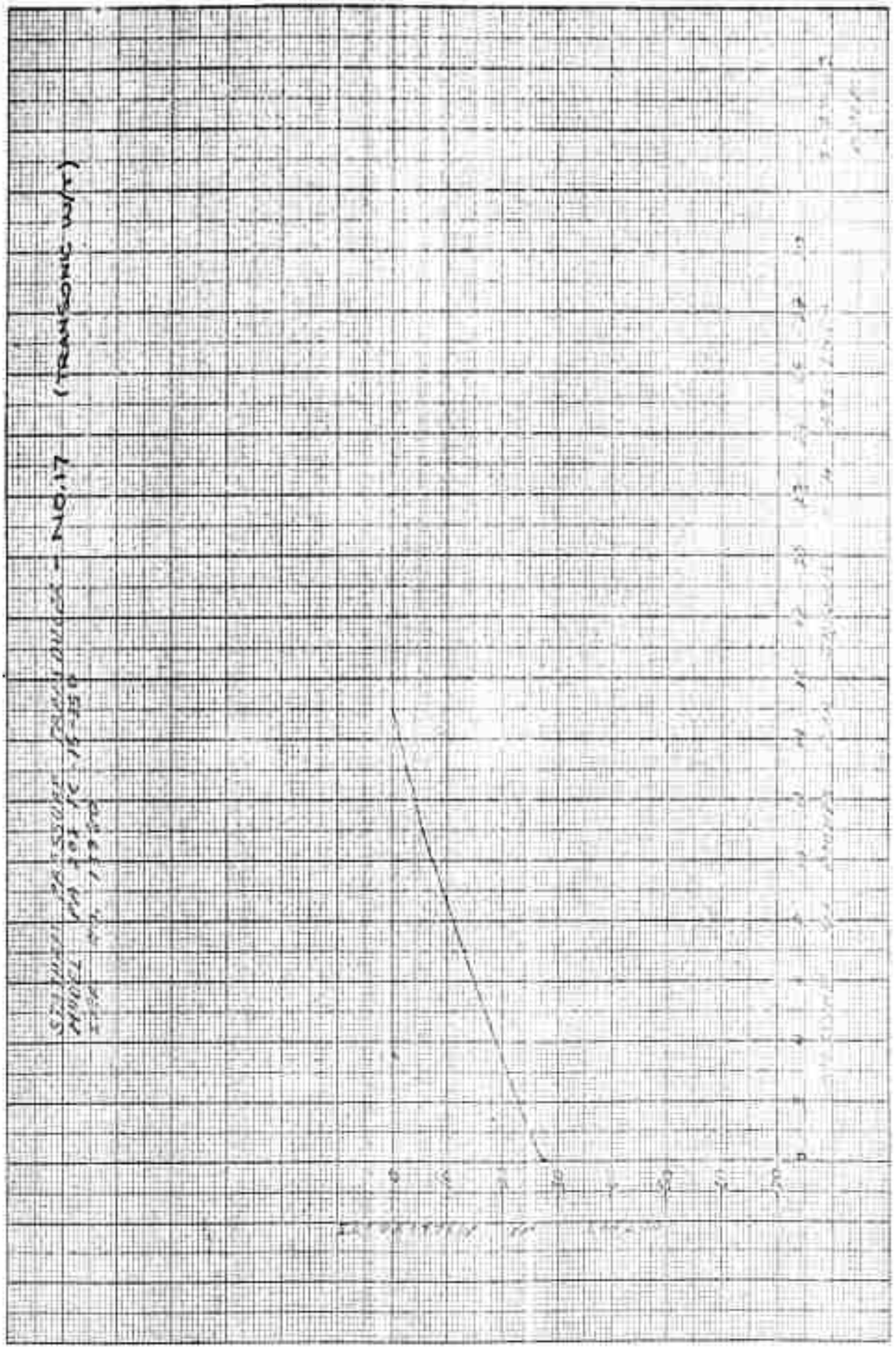


Figure 3.1-23
Page 32

D2-80713

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D2.80713
Figure 3.1-24
Page 33

Figure 3.1-25 D2-80713
Page 34



Figure 3.1-26
Page 35 of 43

K-E AUDIO FREQUENCY 359-466
KEUFFEL & ESSER CO. MADE IN U.S.A.

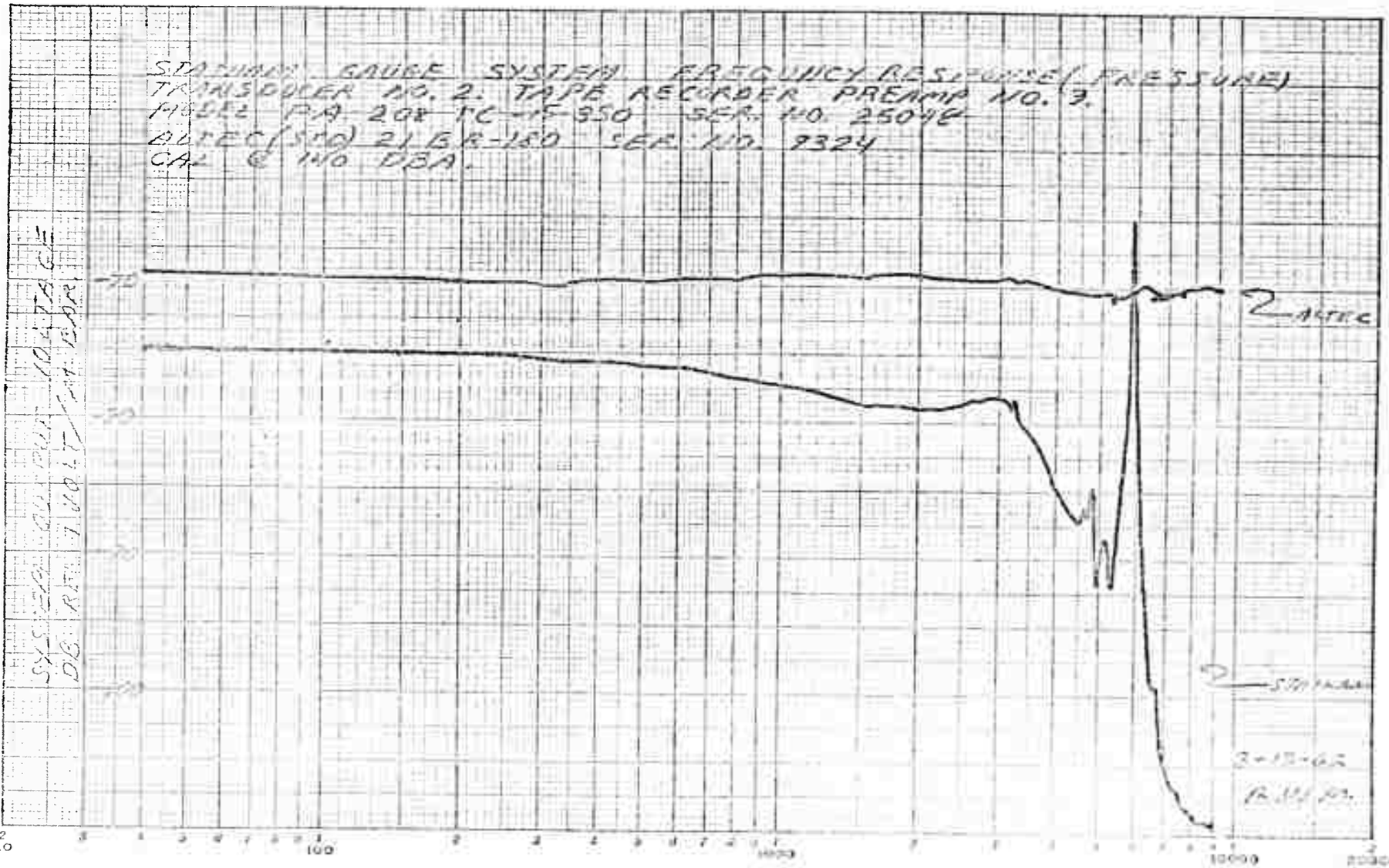


Figure 3.1-27
Page 36 Da-80713

K&E AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.

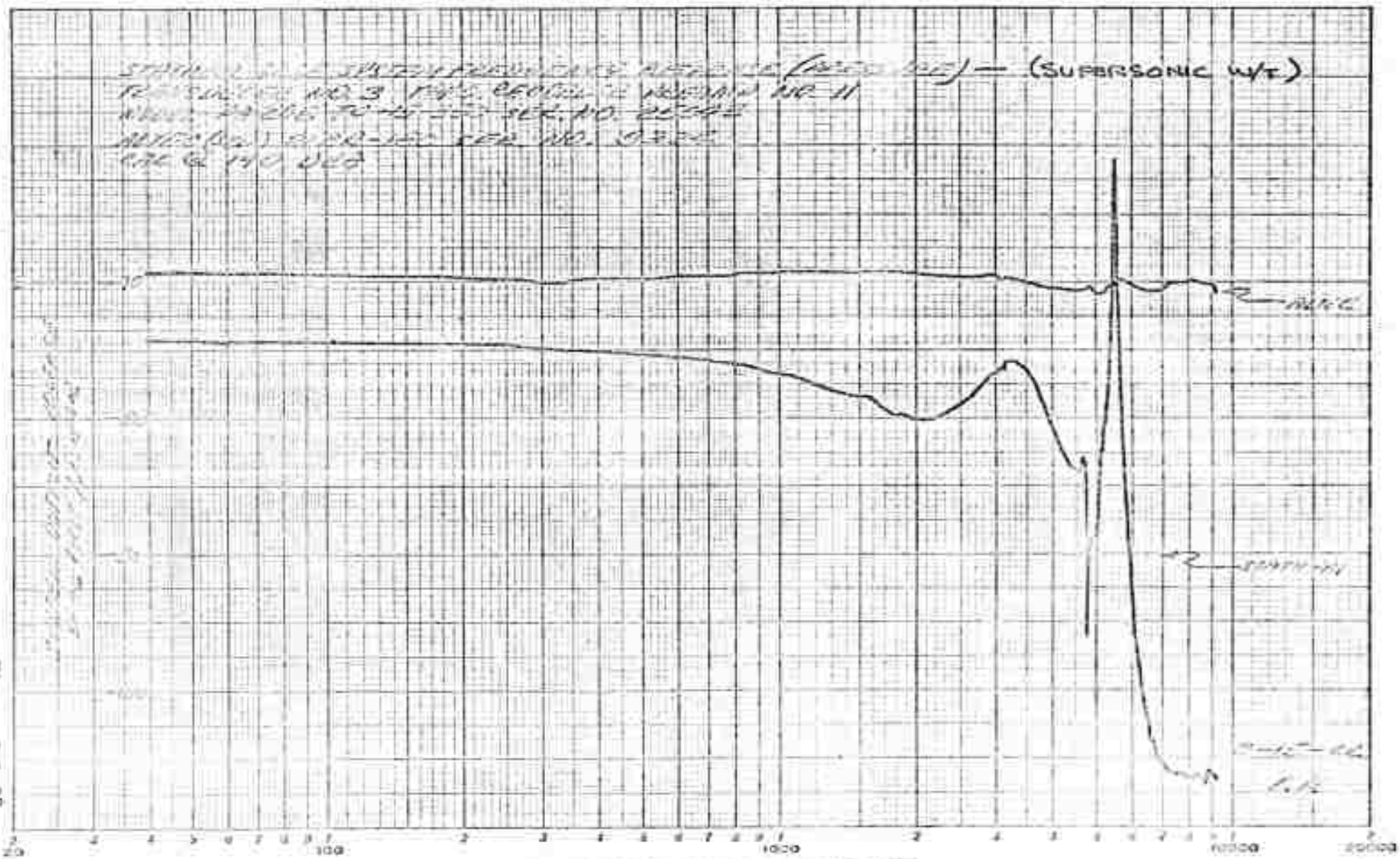


Figure 2.1-28
Page 37 Dec. 8 0713

AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.

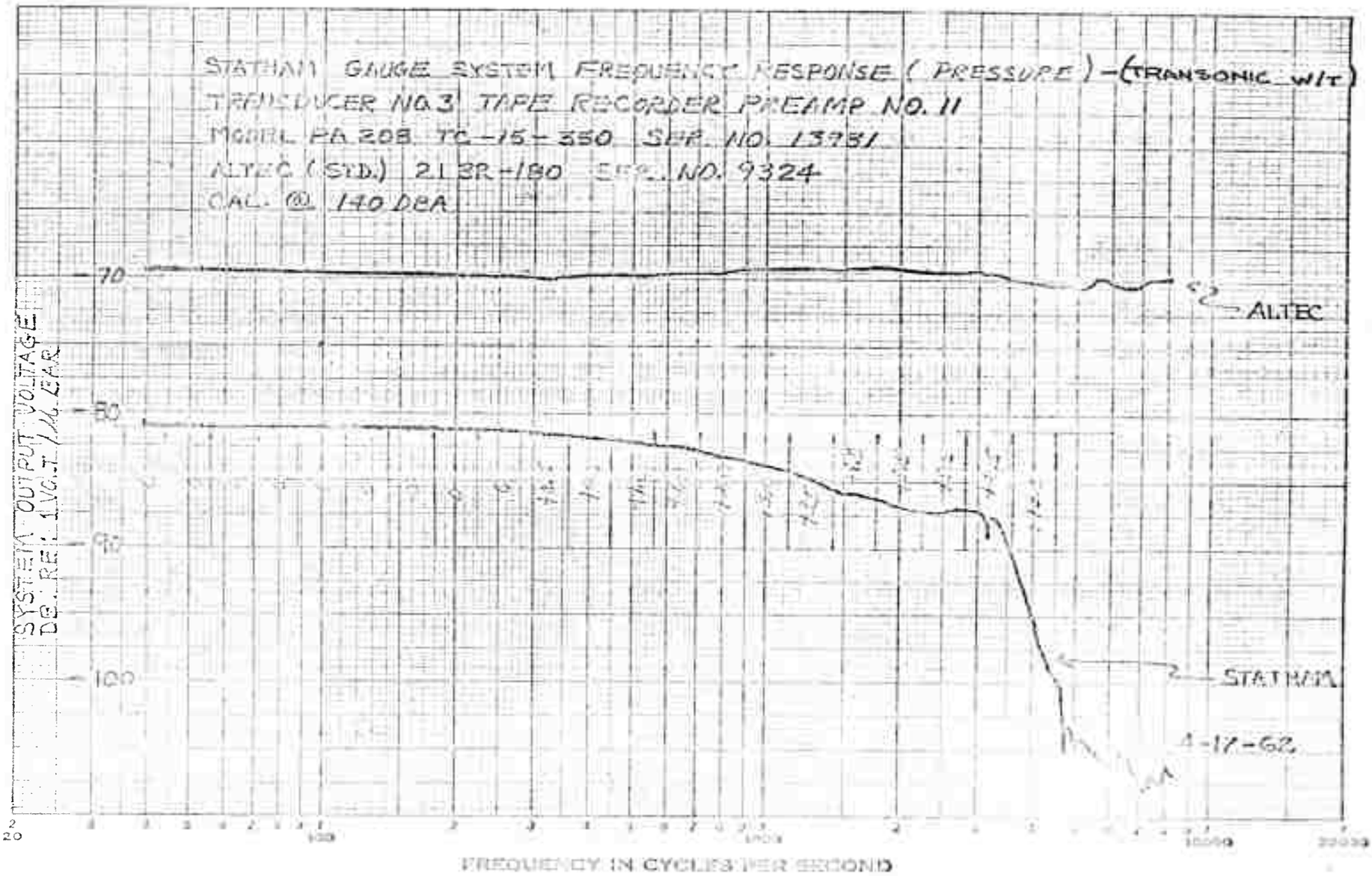


Figure 3.1.29
Page 38 DR-30713

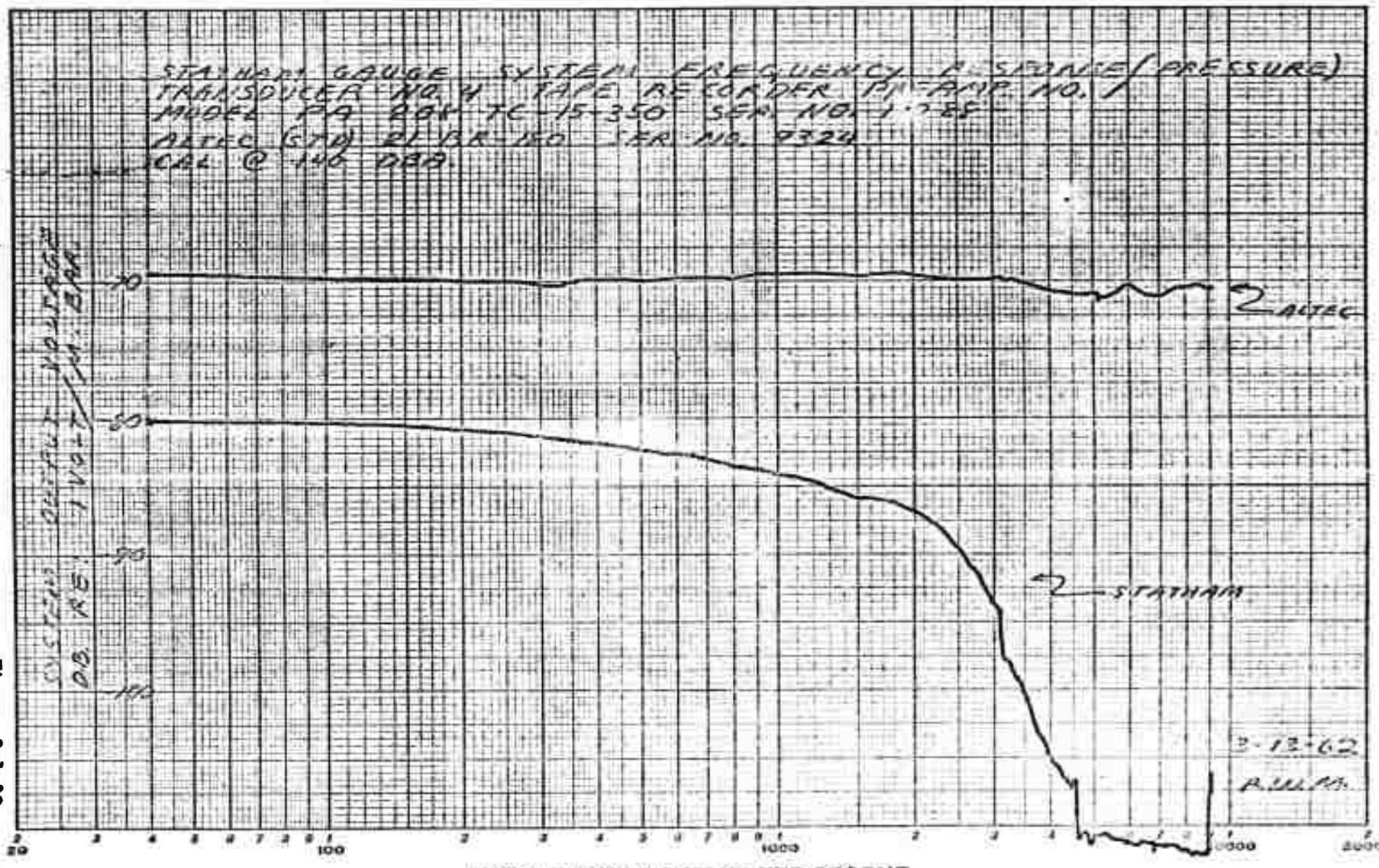
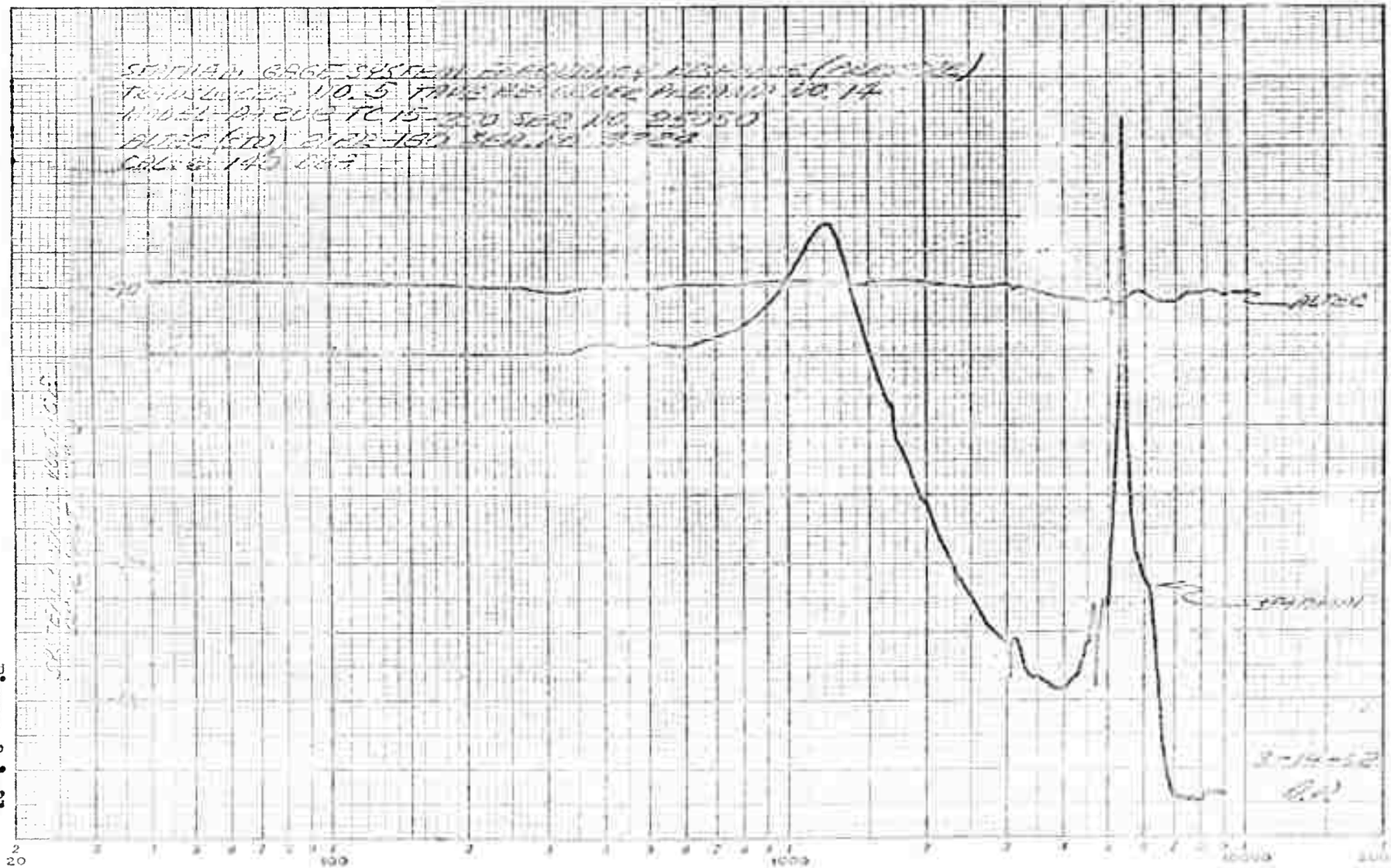

K&E AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO.
STATHAM GAUGE SYSTEM FREQUENCY RESPONSE (PRESSURE)
TRANSDUCER NO. 4 TAPE RECORDER PRE-AMP. NO. 1
MODEL PA 208 TC 15-350 SER. NO. 1-785
DATA (STD) 21 DB-150 SER. NO. 9324
CAL @ 140 DBB.
SYSTEM OUTPUT 1 VOLT/MICROBAR
DB RE 1 VOLT/MICROBAR
-40
-50
-60
-70
AUTEC
STATHAM
3-13-62
R.W.M.
20
100
1000
10000
20000
FREQUENCY IN CYCLES PER SECOND

Figure 3.1-30

AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.



Page 40 D-83-13
Figure 3.1-31

AUDIO FREQUENCY 353-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.

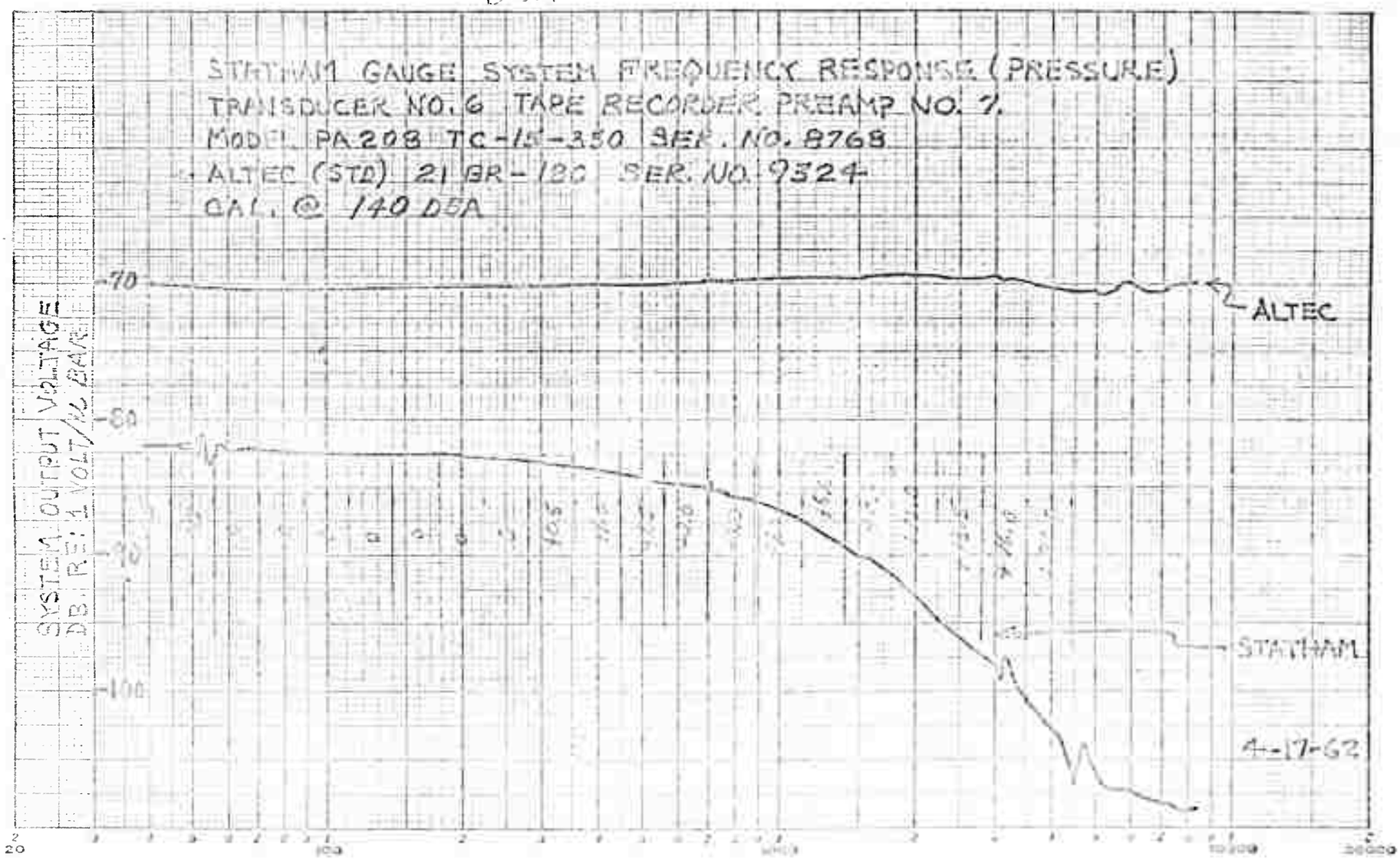


Figure 3-1-32

K-E AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.

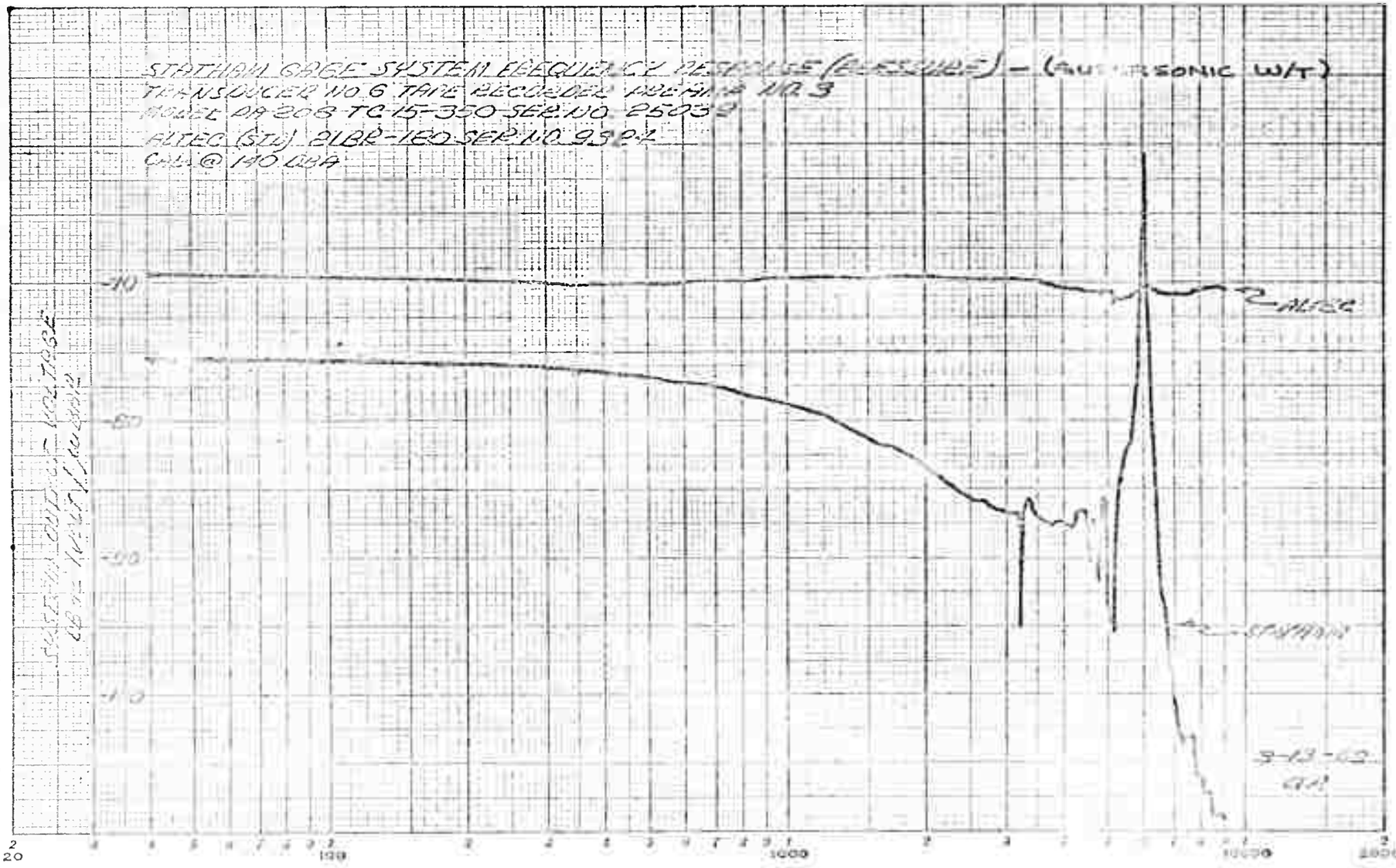


Figure 3.1-33
Page 42 22-80713



Figure 3.1-34
Page 13 of 13
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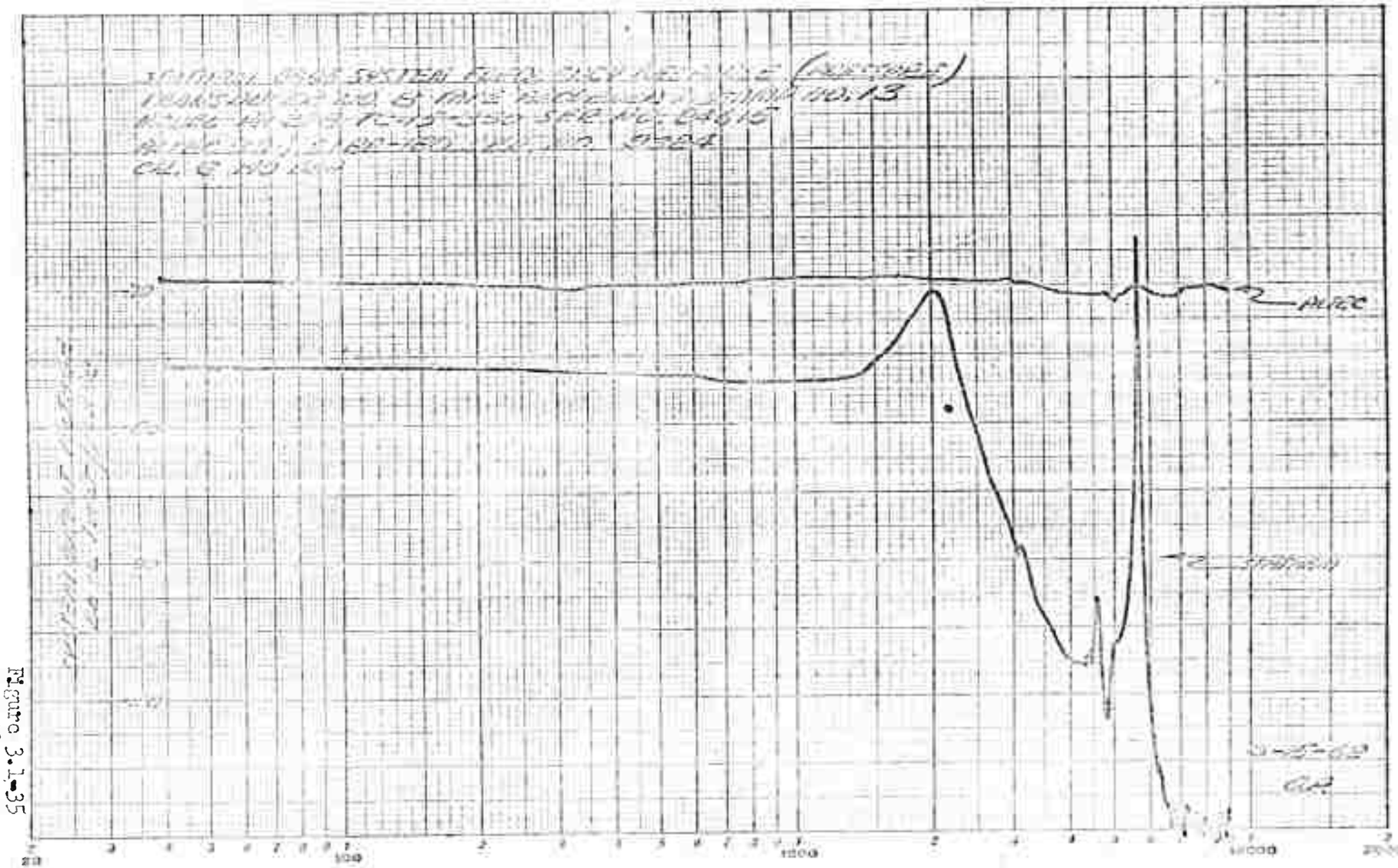


Figure 3.1-35
Page 14
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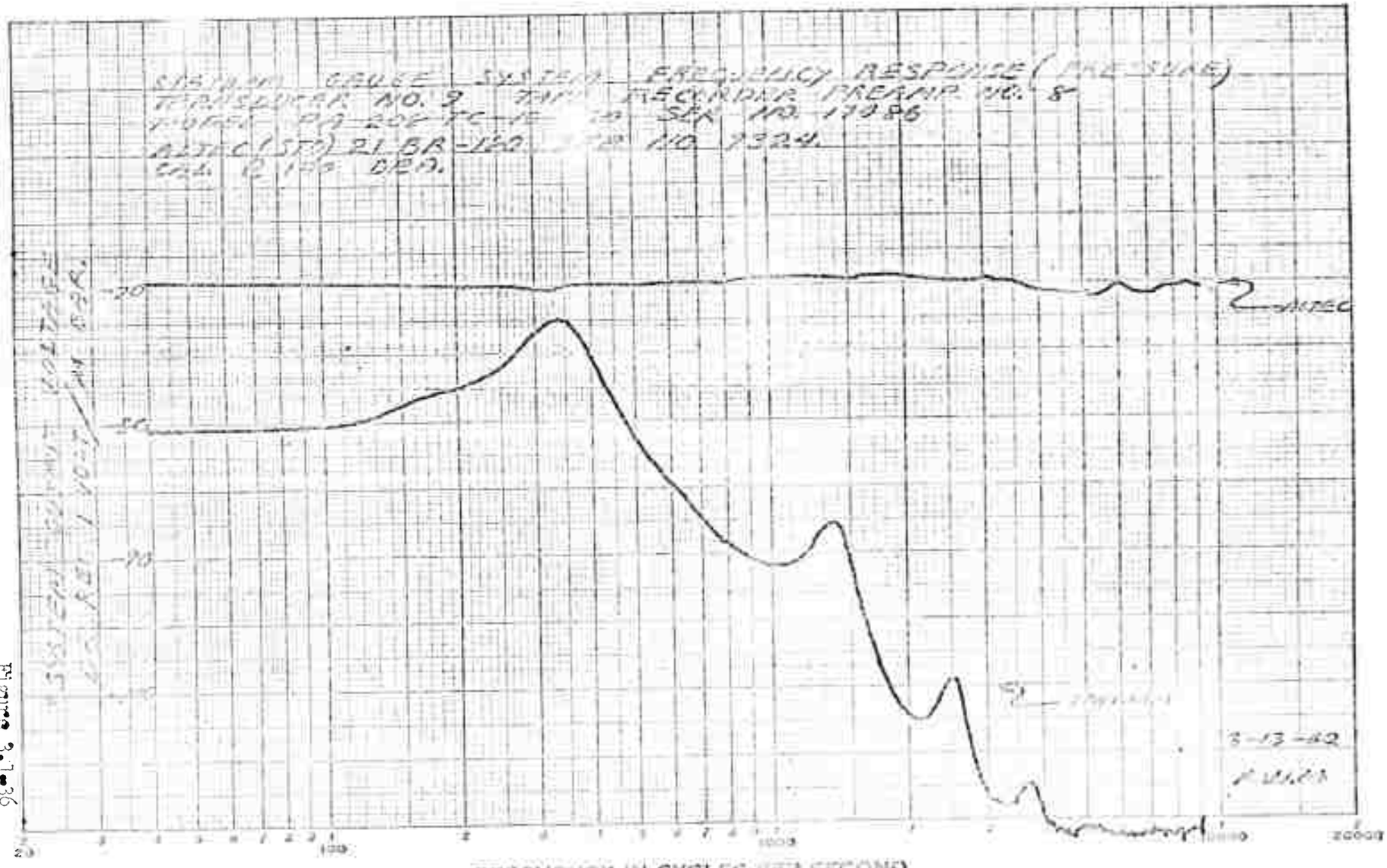


Figure 3.1-36
Page 45 of 3013

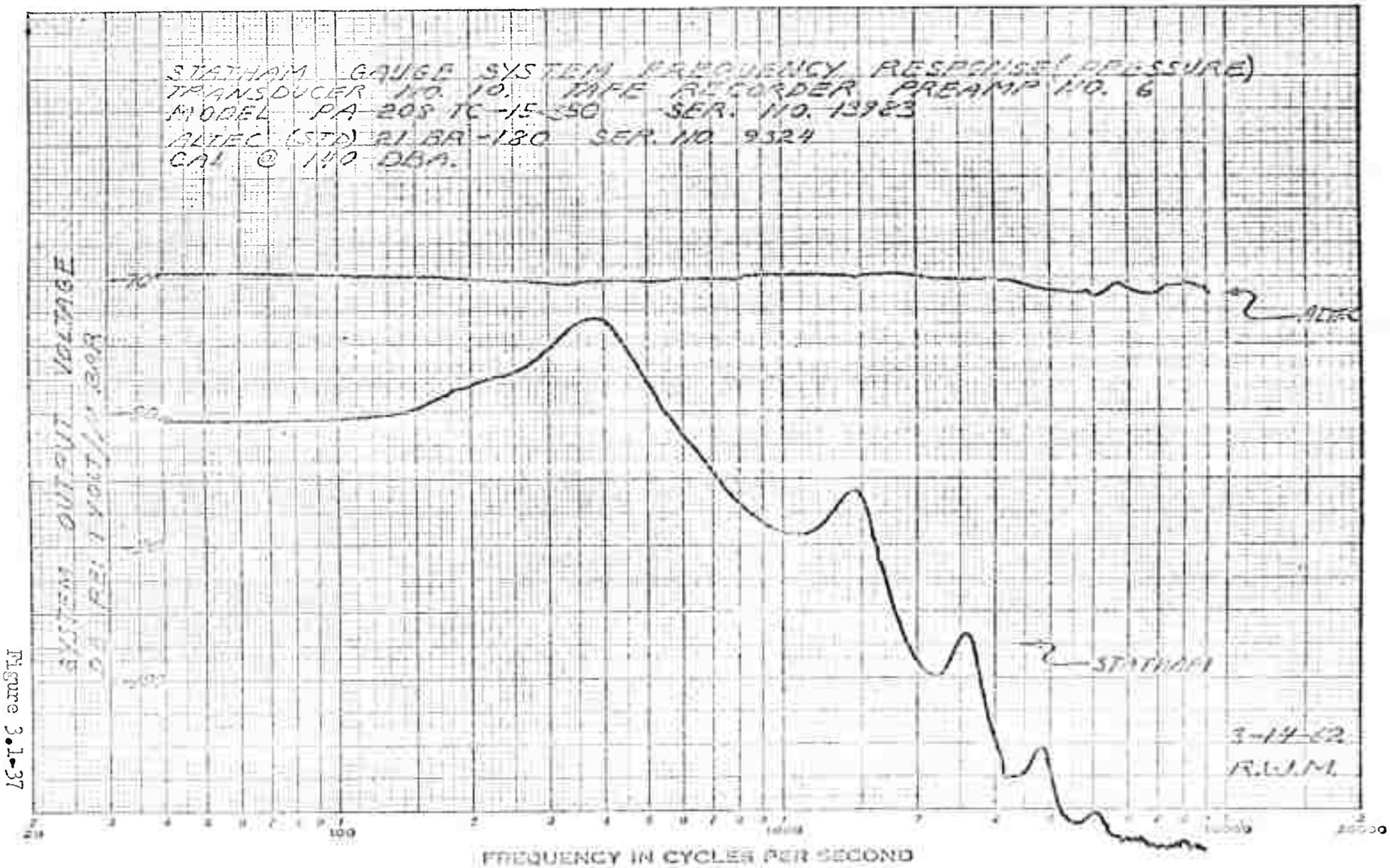


Figure 3.1-37
Page 46 of 82

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AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. HOBOKEN, N.J., U.S.A.

SYSTEM CALIB. SYSTEM FREQUENCY RESPONSE (PRESSURE)
TRANSDUCER NO. 11 TYPE RECORDER PREAMP NO. 10.
AMPLIFIER PA 205-TC-15-350 SER. NO. 25041
RATED [ ] 21 BR-150 SER. NO. 9324
CAL. @ 1000 P.S.I.

2 AMTEC

2 STATHAM

3-17-62

FREQUENCY IN CYCLES PER SECOND

Figure 3.1-38
Page 47
21408.22 8/62

AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.

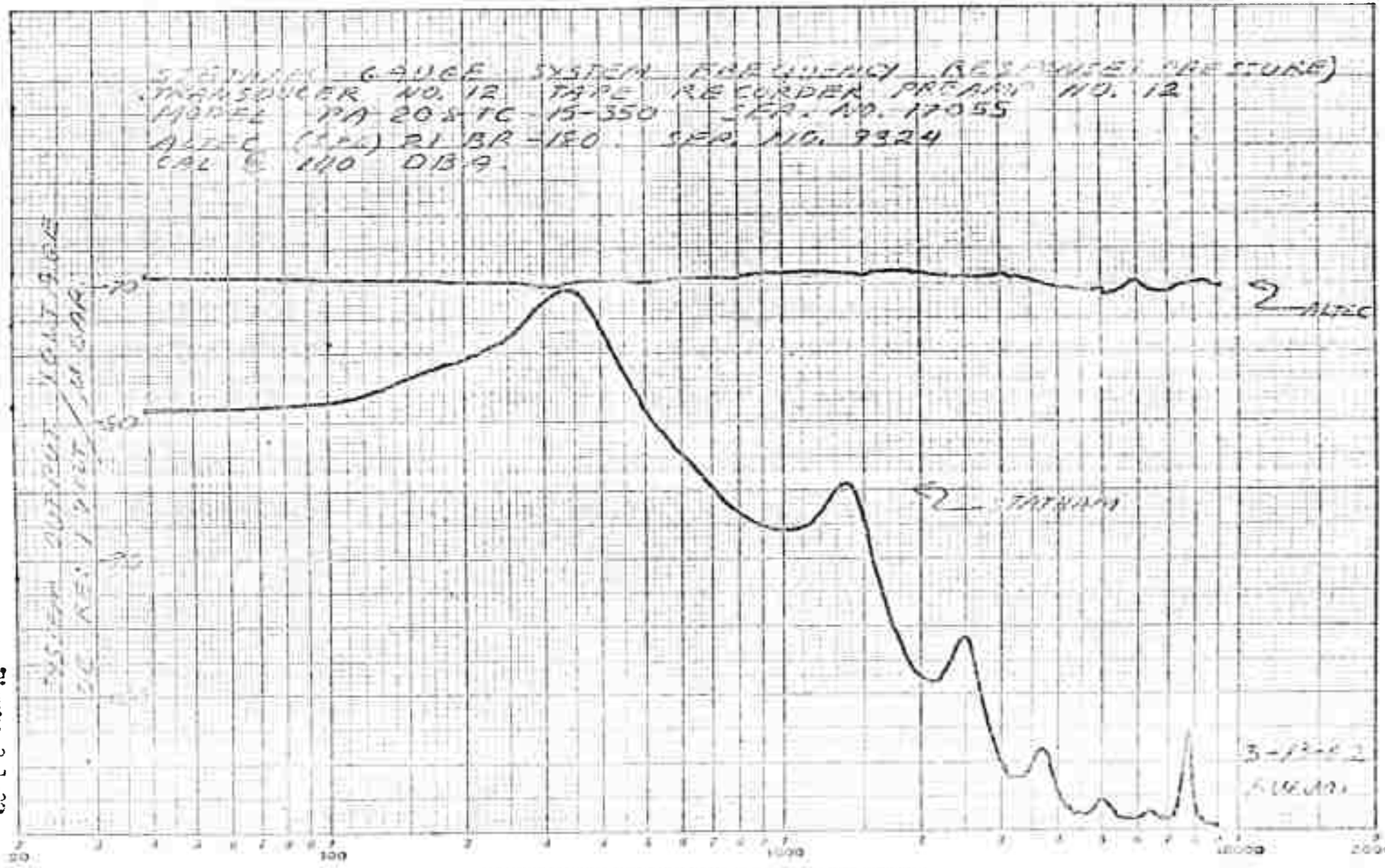
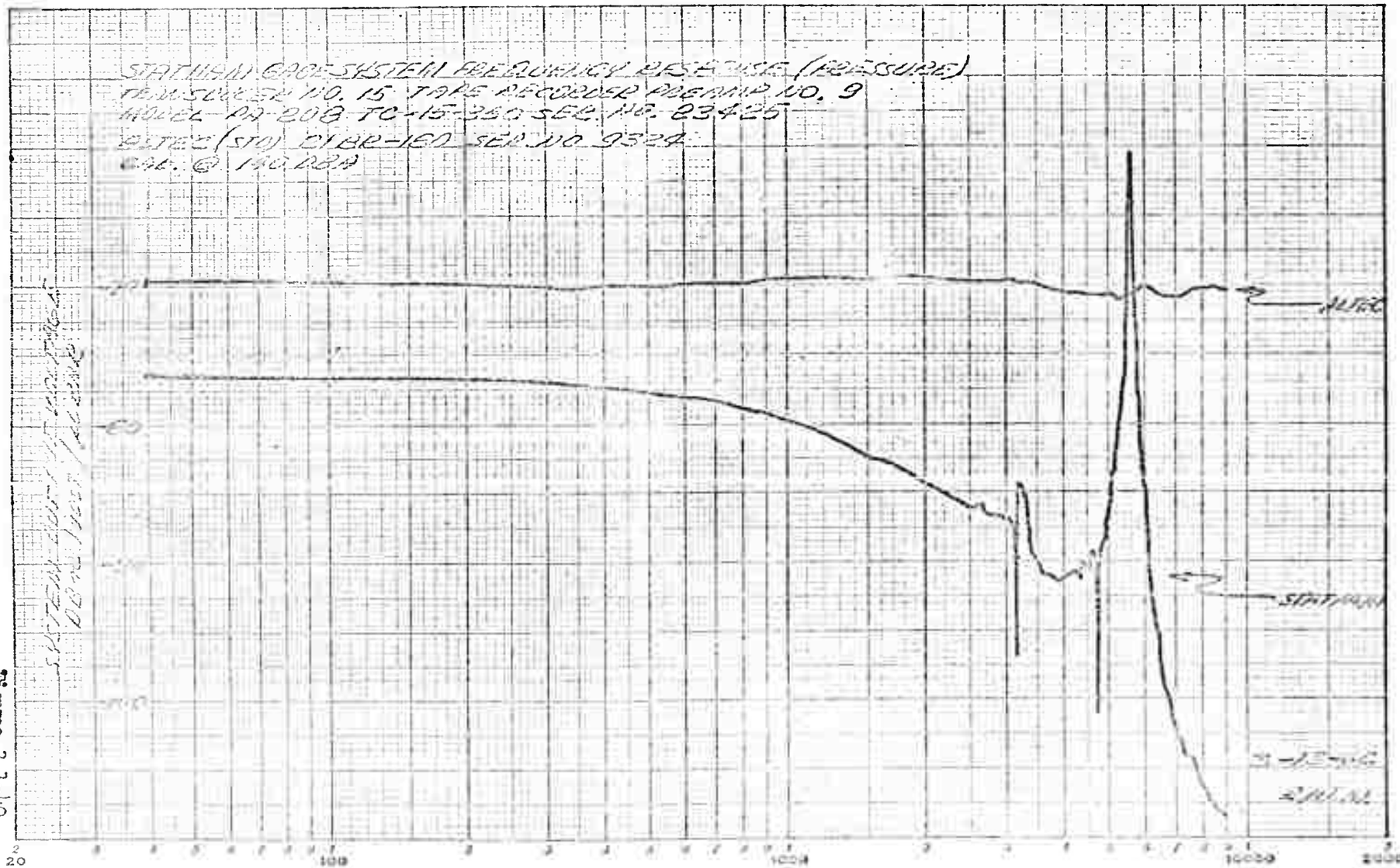


Figure 3.1-39
Page 18 82-5013

AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. PATENTED U.S.A.

SATURN CAB-SYSTEM FREQUENCY RESPONSE (PRESSURE)
TRANSDUCER NO. 15 TAPE RECORDER ASSEMBLY NO. 9
AMPLIFIER NO. 208 TO-15-350 SER. NO. 23425
FILTER (STD) FIBER-ICA SER. NO. 9324
CAL. @ 1000 CPS



FREQUENCY IN CYCLES PER SECOND

Figure 3.1-10
Page 19 Dec 30 '63

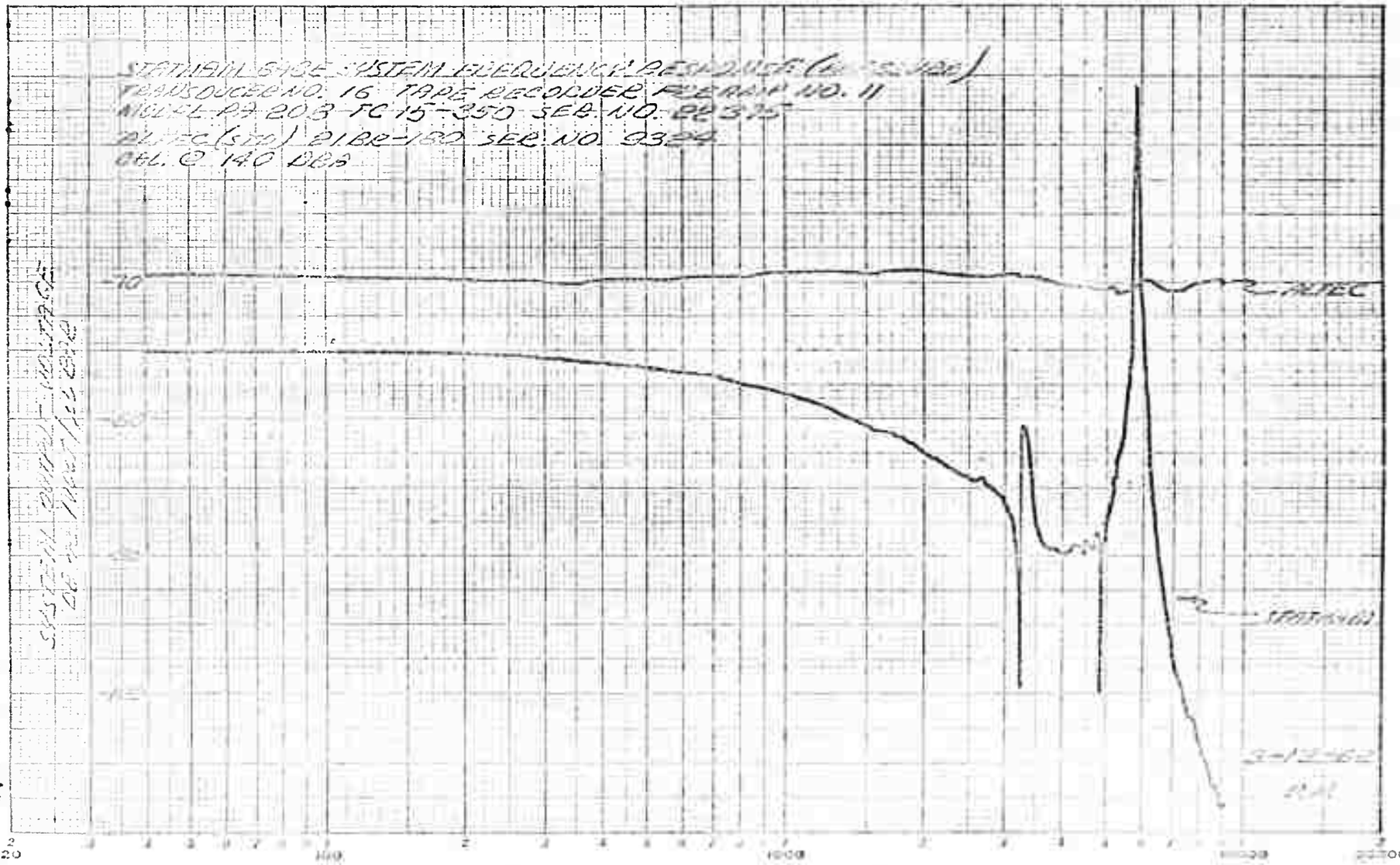


Figure 3.1-41
Page 50 of 178

K&E AUDIO FREQUENCY 350-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.

STATHAM GAUGE SYSTEM FREQUENCY RESPONSE (PRESSURE) -(TRANSONIC W/T)
TRANSDUCER NO. 17 TAPE RECORDER NO. 13
MODEL A 208 TC-15-350 SER. NO. 13780
ALTEC (STD.) 21-BR-180 SER NO. 9324
CAL. @ 140 DBA

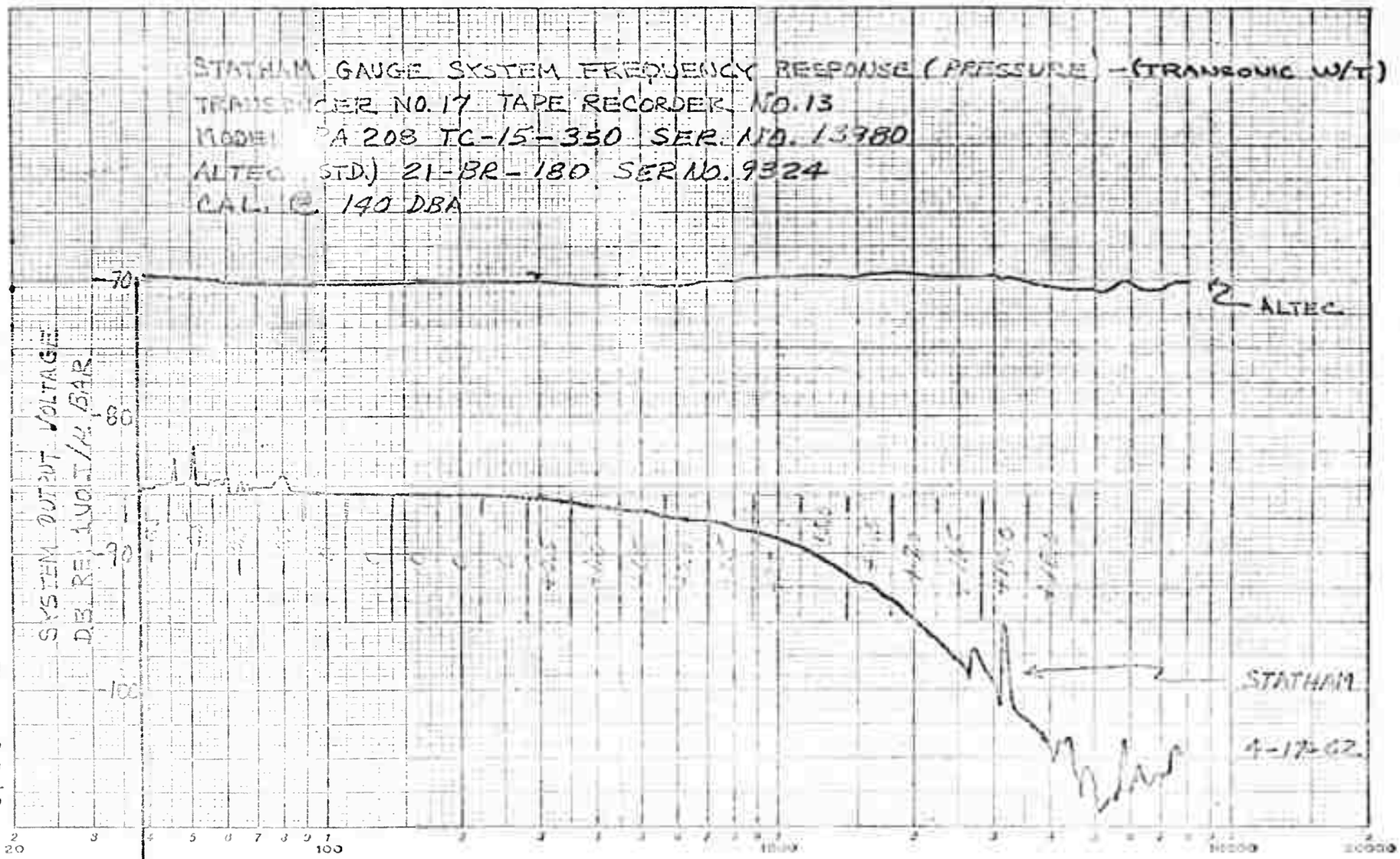


Figure 3.1.42
Page 52 D2-80713

AUDIO FREQUENCY 359-46G
KEUFFEL & ESSER CO. MADE IN U.S.A.

STATHAM GAUGE SYSTEM FREQUENCY RESPONSE (PRESSURE) - (SUPERSONIC W/T)
TRANSDUCER NO. 17 TAPE RECORDER PREAMP NO. 13.
MODEL PA 208 TC 15-350 SER. NO. 25046
ALTEC (STD) 21 BD 120 SER. NO. 9329
CAL. @ 140 DBA.

SYSTEM OUTPUT VOLTAGE
D.B. RE: 1 VOLT IN 1 BAR

ALTEC

STATHAM

3-12-62
P.M.M.

FREQUENCY IN CYCLES PER SECOND

Figure 3.1.3
Page 52 of 88

TABULATION OF THE PHASE ANGLE BETWEEN PAIRS OF TRANSDUCERS

Reference: Test Point 1

Test Point 2

Frequency	Phase Angle
50 cps	0°
600	0
1600	5
1800	11

Test Point 3

Frequency	Phase Angle
50 cps	0°
600	0
1550	5
1800	11

Test Point 4

Frequency	Phase Angle
50 cps	0°
600	4
800	5
1200	10
1300	12

Test Point 6

Frequency	Phase Angle
50 cps	0°
400	5
600	6
1500	10
1550	12

Reference: Test Point 4

Test Point 7

Frequency	Phase Angle
50 cps	1°
210	5
600	10
800	12

Reference: Test Point 10

Test Point 12

Frequency	Phase Angle
50 cps	0°
500	5
600	3
800	0
2000	3
2500	6

Reference: Test Point 15

Test Point 16

Frequency	Phase Angle
50 cps	0°
2600	0

Test Point 17

Frequency	Phase Angle
50 cps	0°
600	0
2600	5

Figure 3.1-44

TABULATION OF THE PHASE ANGLE
BETWEEN PAIRS OF TRANSDUCERS

ITEM 1

Reference: track 5, gage Number 25047, TEST POINT 1

Track 11, gage 13981, Test point 3

FREQUENCY	PHASE ANGLE
50 cps	0°
600	0
1000	+ 5°
1550	+12°

Track 7, gage 8768, Test point 6

FREQUENCY	PHASE ANGLE
50 cps	0°
600	- 5
1600	-12

ITEM 2

Reference: track 9, gage Number 23425, TEST POINT 15

Track 13, gage 73980, Test point 17

FREQUENCY	PHASE ANGLE
50 cps	0°
600	- 5
1500	-12

Figure 3.1-45

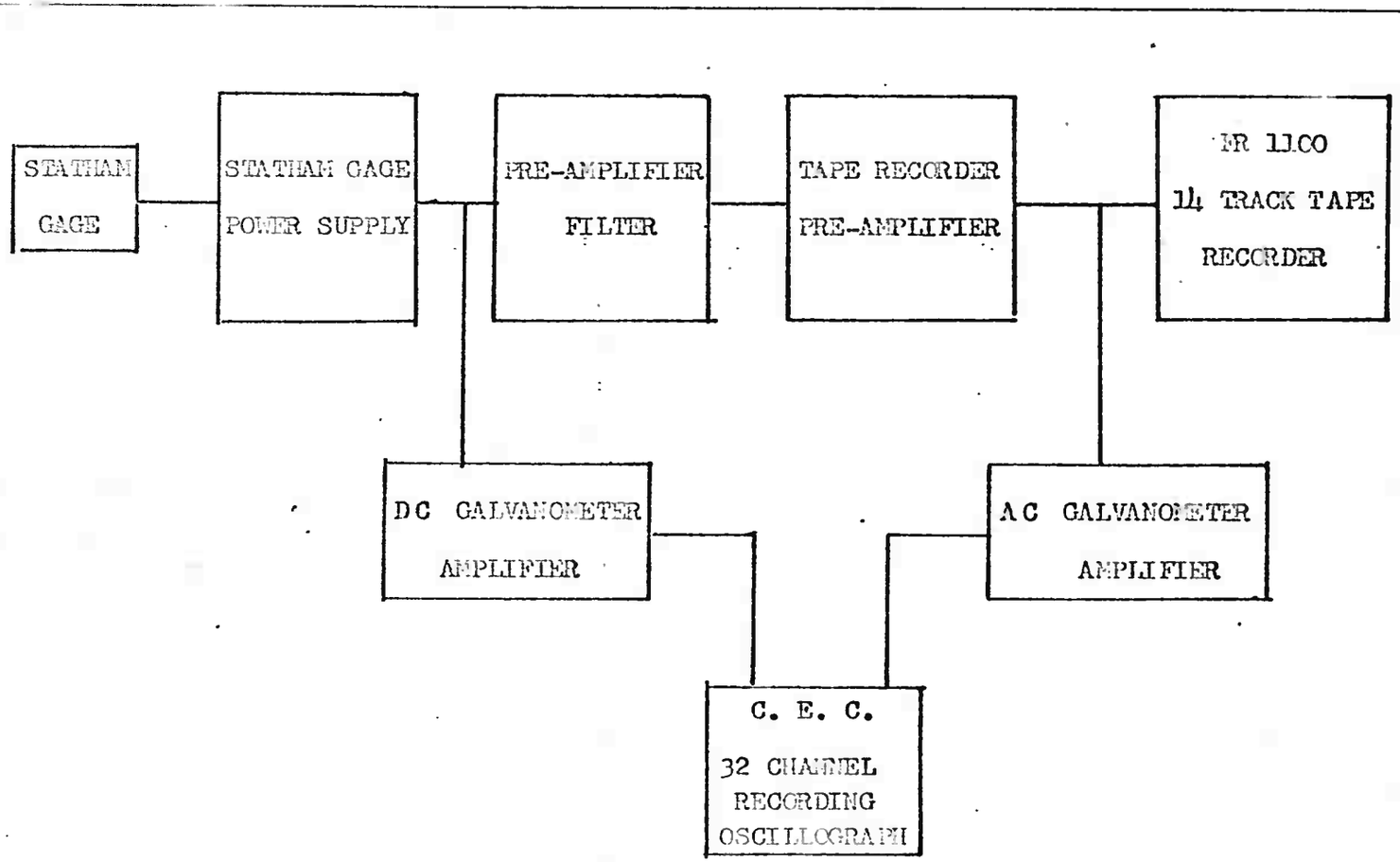
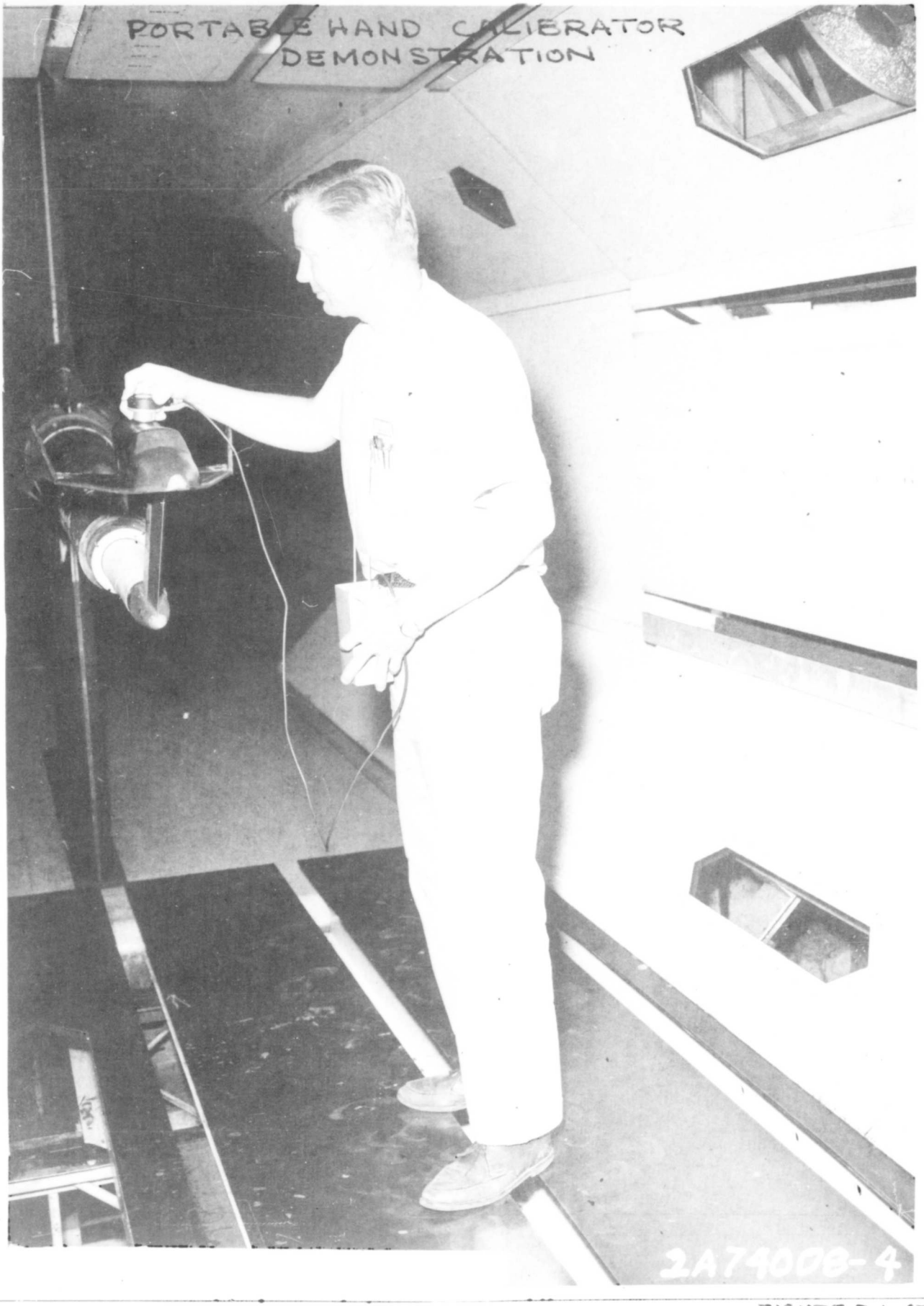


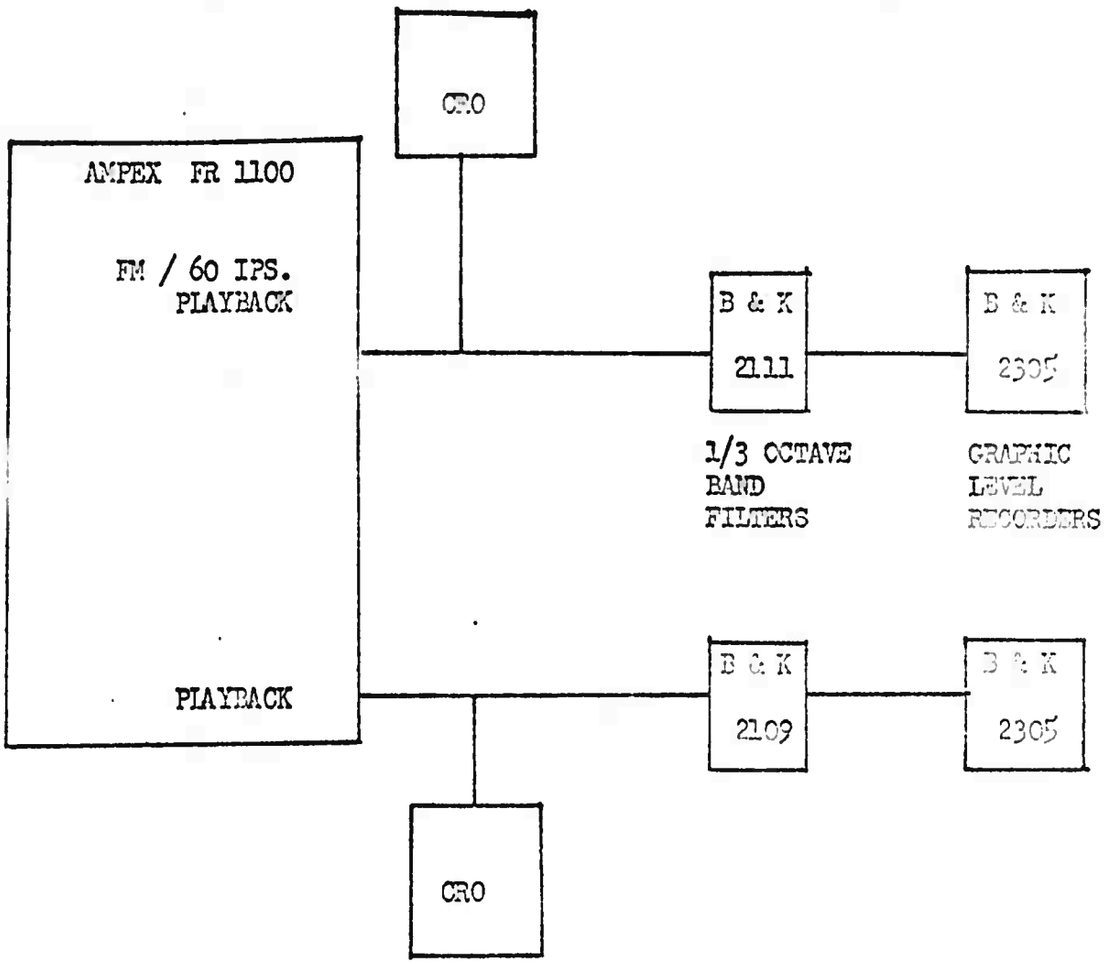
FIGURE 3.1-16

INSTRUMENTATION USED ON EACH DATA RECORD TRACK



BAC 1546 F-R3

FIGURE 3.1-47



BLOCK DIAGRAM

OF

ACOUSTIC DATA REDUCTION SYSTEM

FIGURE 3.1-48

$$\text{SPACE CORRELATION COEFFICIENT, } R = \frac{\widetilde{x\ y}}{\widetilde{x} * \widetilde{y}} = \frac{1}{4}\,\frac{\widetilde{(x+y)^2} - \widetilde{(x-y)^2}}{\widetilde{x} * \widetilde{y}}$$

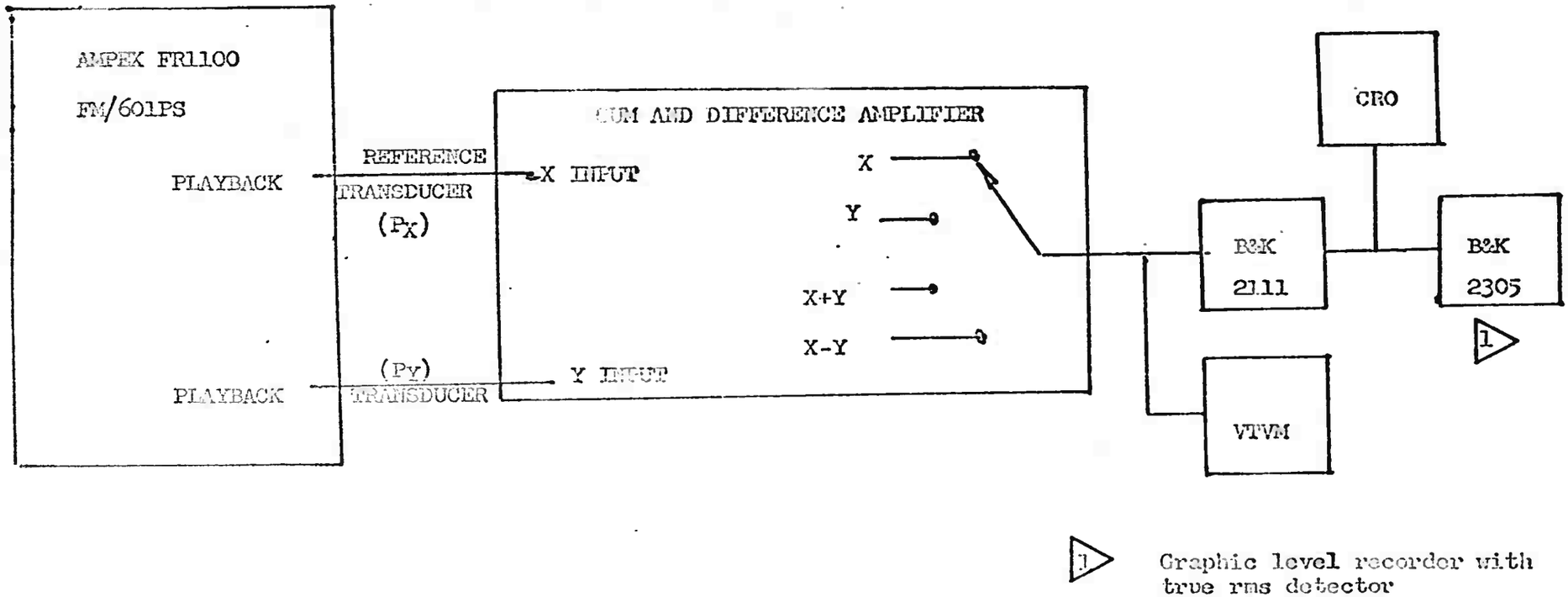


FIGURE 3.1.1-6

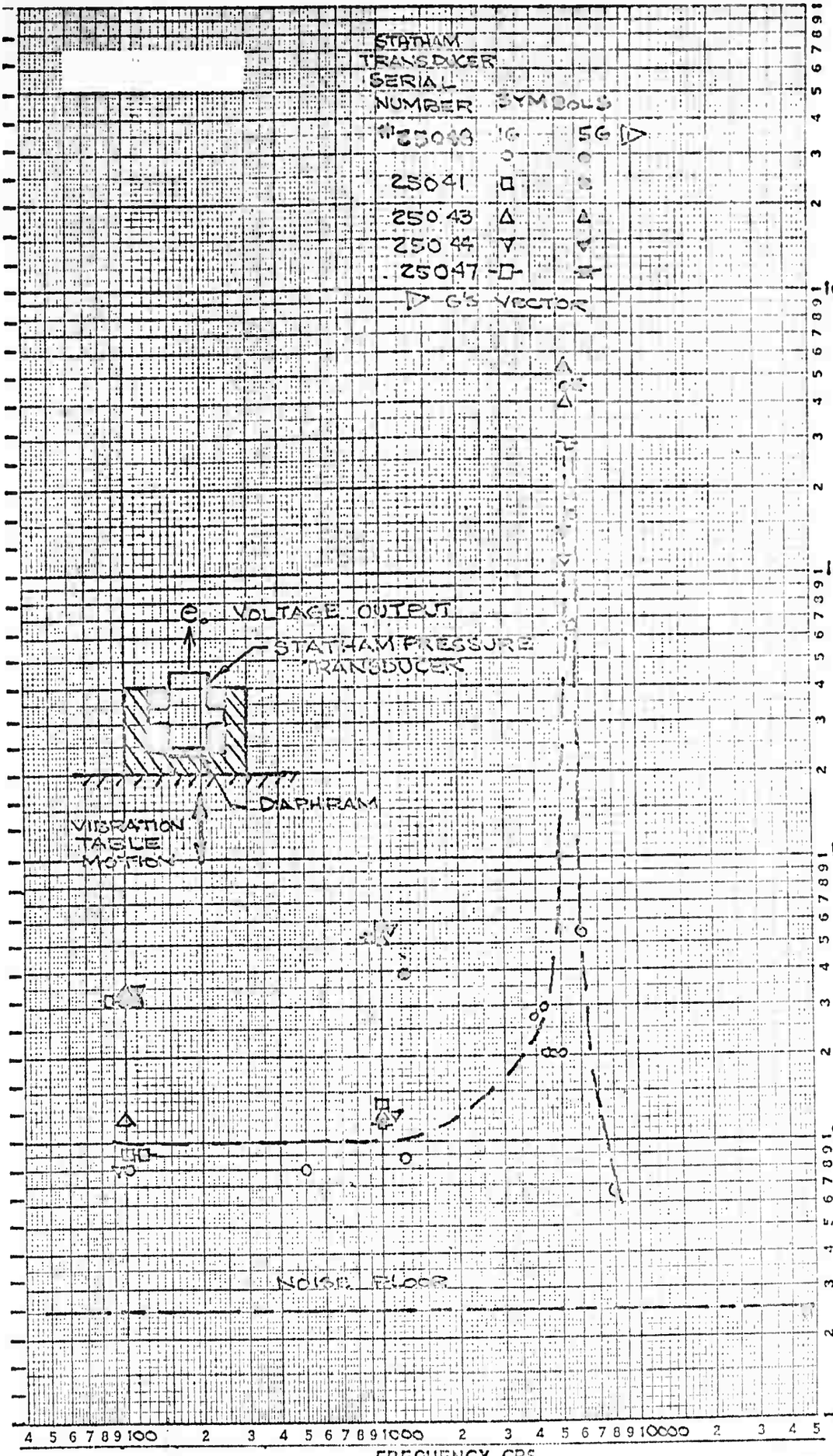
BLOCK DIAGRAM OF THE SPACE CORRELATION ANALYSIS SYSTEM

3.2 VIBRATION INSTRUMENTATION

The vibration response of low sensitivity acoustic transducers can result in spurious data. That is, the signal generated by the transducer due to the model glider vibratory motion could be on the order of or greater than the signal generated by fluctuating pressures. Therefore, a test was performed at a Boeing vibration laboratory to determine the vibration sensitivity of the test program Statham transducers. The results of the transducer vibration test are shown in Figure 3.2-1.

In order to provide model glider vibration data during the test program, three accelerometers were mounted within the glider canopy to measure vibration in mutually perpendicular directions. The instrumentation system used to measure glider vibration is shown in Figure 3.2-2.

Based on these data, a large part of the "acoustic data" was rejected as invalid since the expected transducer output due to vibration alone was less than 10 db below the observed output due to aerodynamic noise.



CONDITION

TEST NO.

CALC			REVISED	DATE	VIBRATION SENSITIVITY OF STATHAM PRESSURE TRANSDUCERS TYPE PA 208-15-350
CHECK					
APPR					
APPR					
					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON

FIGURE 3.2-1

D2-80713

PAGE 60

2-5353-4-29

BLOCK DIAGRAM OF VIBRATION MEASUREMENT SYSTEM

Figure 3.2-2

BAC 1546 6-R3

4.0 TRANSONIC WIND TUNNEL TEST

4.1 PURPOSE

The purpose of this test was to measure the magnitude, frequency spectrum, and space correlation of fluctuating aerodynamic pressures on the glider in the transonic speed regime due to:

(a) Fluctuating base pressures

(b) Fluctuating wake pressures

(c) Fluctuating cavity pressures

(d) Separated flow

(e) Fluctuating shock waves

4.2 TEST FACILITY

The test was conducted during the period of 18 April 1962 through 19 April 1962 in the Boeing Transonic Wind Tunnel Facility at Seattle, Washington.

4.3 MODEL CONFIGURATION

The model glider wind tunnel configuration drawing is shown in Figure 4.3-1.

4.4 TEST PROCEDURE

The transonic test procedure was performed in the following manner:

(a) The model test configuration was set at the appropriate angle of attack, elevon deflection, and rudder deflection as specified in the test plan (Figure 4.5-1).

(b) Next, the tunnel test condition at the appropriate Mach number was initiated.

(c) When stable conditions existed in the tunnel test section, 10 seconds of acoustic, vibration, and tunnel test parameters were recorded.

(d) The procedure was repeated for all conditions specified in the test plan.

4.5 TEST RESULTS

4.5.1 Tunnel Test Conditions

Figure 4.5-1 summarizes the Mach numbers, elevon deflections, and rudder deflections specified during the transonic test program.

4.5.1 (Continued)

Figure 4.5-2 shows nominal dynamic pressure, total pressure, total temperature, test section static pressure, and Reynolds number/ft at each Mach number tested.

4.5.2 Acoustic Test Results - Sound Pressure Levels [1]

The acoustic test results in 1/3 octave band sound pressure levels from the transonic wind tunnel test program are tabulated in Figures 4.5-3 through 4.5-35. The results presented represent all acoustic data measured on the model glider in the transonic wind tunnel with an overall equal to or greater than 145 db. Overall sound pressure levels indicated in the test results were computed from the corrected 1/3 octave band sound levels. The RMS pressure coefficient (σ_p = RMS Fluctuating Pressure/Dynamic Pressure) is also tabulated for each test condition. One-third octave band sound levels with lines drawn through them or omitted are suspect due to the vibration response of the Statham transducers (See Section 5.5.2 for a further discussion on the vibration response of Statham transducers in equivalent sound levels).

Envelopes of maximum 1/3 octave band sound levels observed in different areas of the model glider are shown on Figures 4.5-36 and -37. Figure 4.5-37a identifies each envelope of maximum 1/3 octave band sound levels and its associated model glider area.

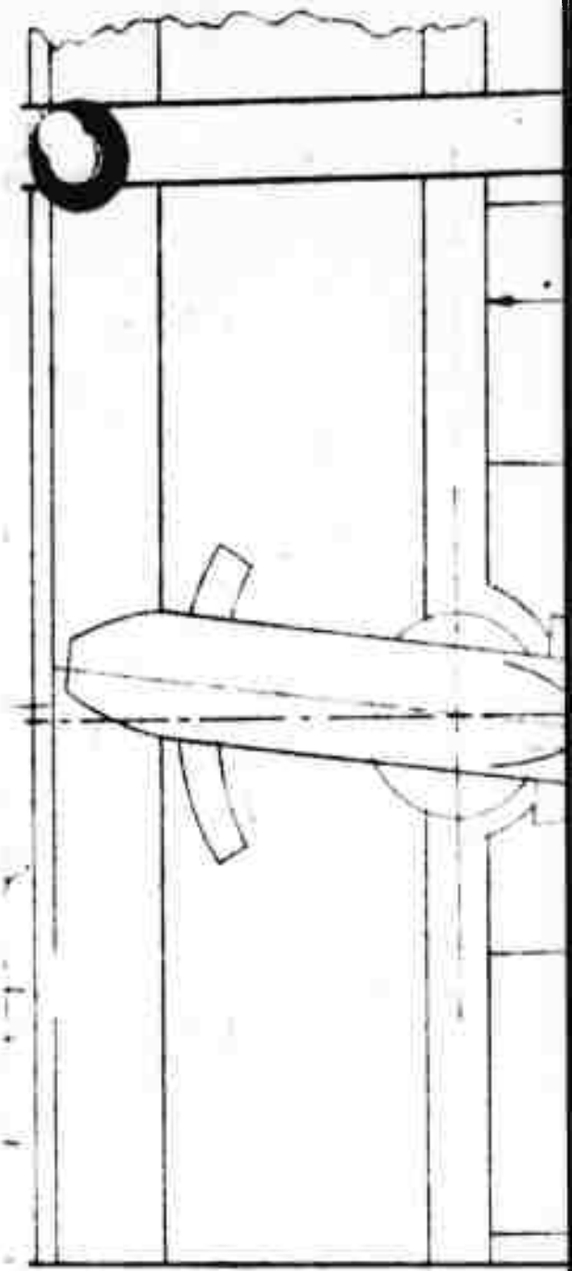
4.5.3 Acoustic Test Results - Space Correlation Coefficients

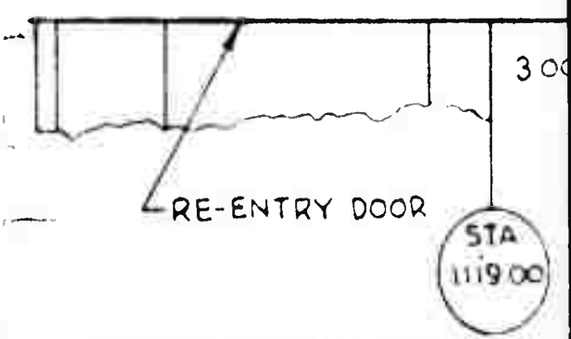
Space correlation coefficients of glider transducers pairs are shown plotted in Figures 4.5-38 through 4.5-58. Only a limited number of test points and test conditions were chosen for measurement of space correlation.

4.5.4 Vibration Test Results

Figures 4.5-59 through 4.5-67 show envelopes of model glider vibration data measured during the transonic wind tunnel test program.

[1] The aerodynamic noise pressures are reported in terms of sound levels on the logarithmic db scale. This form is more directly usable by the acoustical engineer and provides vastly improved detail at low noise levels over a linear scale of pressures.





ILLER MR.

CALC.	RINDERSON	
CHECK	STOCKMAN	6-27-64
APPD.		
APPD.		

LD 4011 0000 (WAS BAC 260 P)

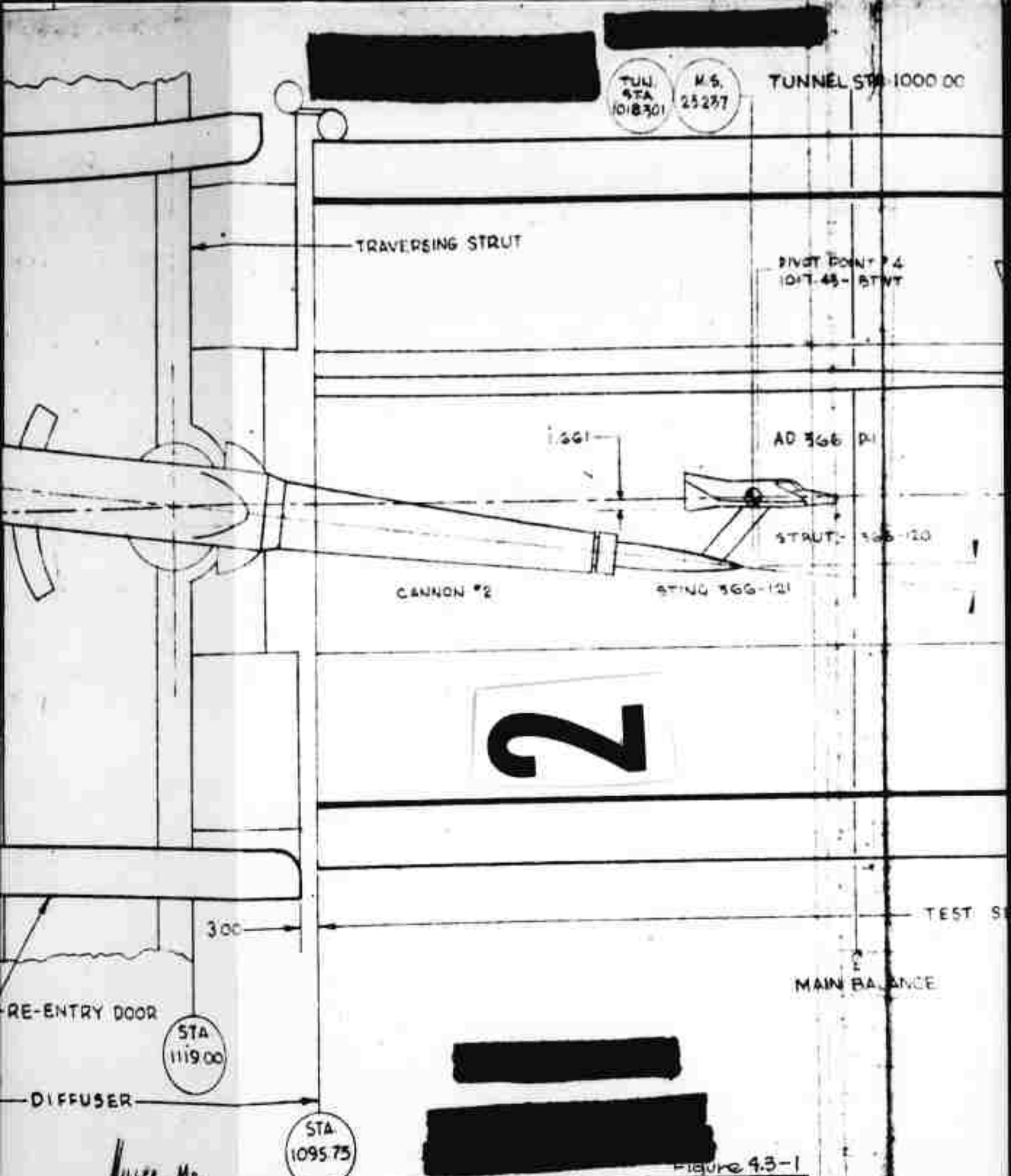


Figure 4.3-1

CALC. ANDERSON		REVISED	DATE
CHECK STOCKMAN	6-27-61		
APPD.			
APPD.			

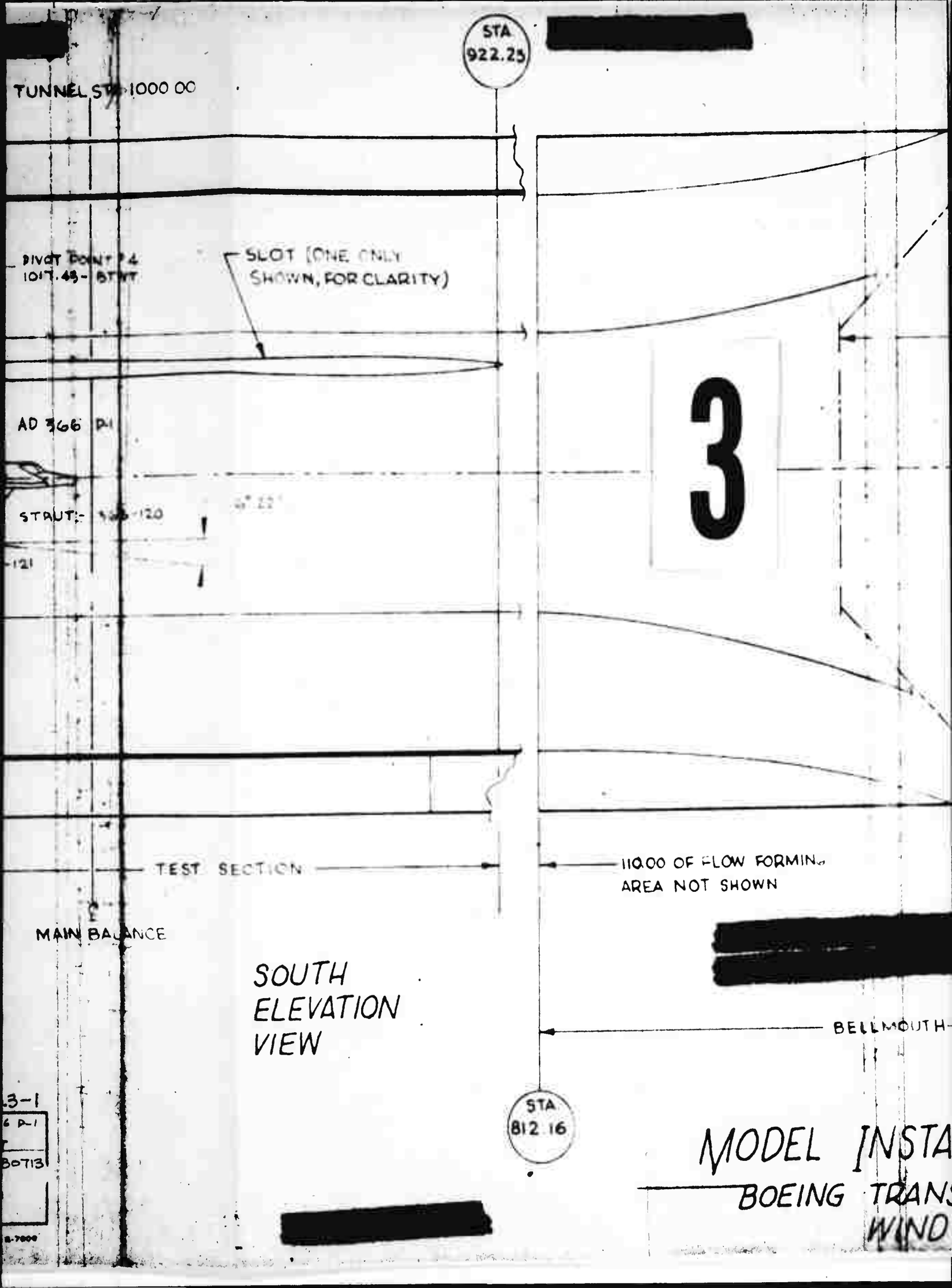
MODEL SKETCHES.

AD 566 P-1
BTWT
D2-80713

BOEING AIRPLANE COMPANY

PAGE

8-7000


STA 922.25
TUNNEL STA 1000.00
PIVOT POINT P4 1017.48 - BTWT
SLOT (ONE ONLY SHOWN, FOR CLARITY)
AD 366 P4
STRUT:- 120
121
3
TEST SECTION
110.00 OF FLOW FORMING AREA NOT SHOWN
MAIN BALANCE
SOUTH ELEVATION VIEW
BELLMOUTH
STA 812.16
MODEL INSTA
BOEING TRANS
WIND

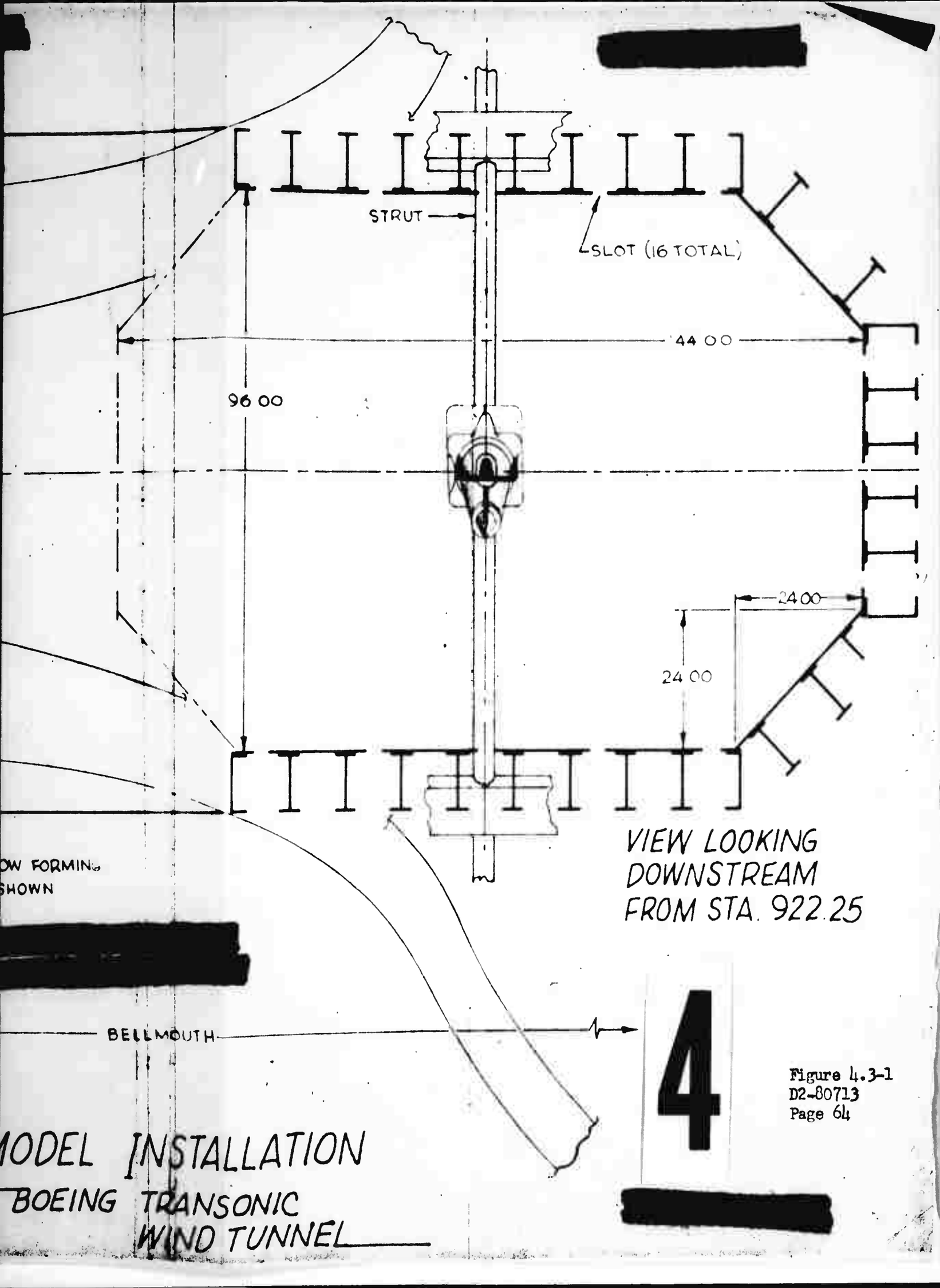


Figure 4.3-1
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Run No.	Mach No.	α	δe	δr
		GLIDER WITH TRANSITION CONFIGURATION		
3-5	.5	▷1	-10°	0°
6-8	.6			
9-11	.7			
12-14	.8			
15-17	.85			
18-20	.9			
21-23	.95			
24-26	1.0			
27-29	1.1			
30-56		REPEATED RUNS 3-29 TEST CONDITIONS		
57-63	.8	▷2	-10°	0°
64-70	.85			
71-77	.9			
78-84	.95			
85-112		REPEATED RUNS 57-84 TEST CONDITIONS		
113-119	.8	▷2	0°	0°
120-126	.85			
127-133	.9			
134-140	.95			

NOTATION USED :

1. α = -10°, 0°, +10°
2. α = -10°, -6°, -3°, 0°, +3°, +6°, +
3. α = -10°, 0°, +18°
4. α = -10°, -6°, -3°, 0°, +3°, +6°, +10°, +14°,
5. M = .8 to .95 in 1/100th Mach N steps
6. α = -10°, 0°, +10°, +18°

α = Angle of Attack
δe = Elevon Deflection
δr = Rudder Deflection

CALC	JS	7/19/62	REVISED	DATE
CHECK				
APR				
APR				

TRANSONIC WIND TUNNEL TEST CONDITIONS

Figure 4.5-1a

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BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON

GLIDER WITH TRANSITION CONFIGURATION

RUN NO.	MACH NO.	α	δ_e	δ_r
141-147	.8	▷2	+10°	0°
148-154	.85	↓	↓	↓
155-161	.9			
162-168	.95			

GLIDER W/O TRANSITION CONFIGURATION

169-171	1.1	▷3	0°	-30°
172-174	1.0	↓	↓	↓
175-177	.95			
178-180	.9			
181-183	.85			
184-186	.8			
187-189	.7			
190-192	.6			
193-195	.5			
196-198	1.1	▷3	0°	0°
199-201	1.0	↓	↓	↓
202-204	.95			
205-207	.9			
208-210	.85			
211-213	.8			
217-219	.7			

CALC	JS	7/19/62	REVISED	DATE
CHECK				
APR				
APR				

TRANSONIC WIND TUNNEL
TEST CONDITIONS

BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON

Figure 4.5-1b

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GLIDER W/O TRANSITION CONFIGURATION

217-219	.6	3	0°	0°
220-222	.5	↓	↓	↓
223-225	1.1	3	0°	+35°
226-228	1.0	↓	↓	↓
229-231	.95	↓	↓	↓
232-234	.9	↓	↓	↓
235-237	.85	↓	↓	↓
238-240	.8	↓	↓	↓
241-243	.7	↓	↓	↓
244-246	.6	↓	↓	↓
247-249	.5	↓	↓	↓
250	.8	-10°	-30°	0°
251	↓	0°	↓	↓
252	↓	+18°	↓	↓
253	↓	-6°	↓	↓
254	↓	-3°	↓	↓
255	↓	0°	↓	↓
256	↓	+3°	↓	↓
257	↓	+6°	↓	↓
258	↓	+10°	↓	↓
259	↓	+14°	↓	↓
260	↓	+18°	↓	↓

			REVISED	DATE
CALC	JS			
CHECK				
APR				
APR				

TRANSONIC WIND TUNNEL TEST CONDITIONS

Figure 4.5-1c

D2-80713

BOEING AIRPLANE COMPANY
SEATTLE 24, WASHINGTON

GLIDER W/O TRANSITION CONFIGURATION

RUN NO.	MACH No.	α	δe	δr
261-269	.85	4	-30	0°
270-278	.9	↓	↓	↓
279-288	.8	4	-20	0°
289-296	.85	↓	↓	↓
297-305	.9	↓	↓	↓
306-314	.9	4	-10°	0°
315-323	.85	↓	↓	↓
324	TUNNEL PRACTICE RUN			
325-333	.8	4	-30°	-10°
334-342	.85	↓	↓	↓
343-351	.9	↓	↓	↓
352-360	.8	4	-30°	+35°
361-369	.85	↓	↓	↓
370-378	.9	↓	↓	↓
379-387	.8	4	+10°	+35°
388-396	.85	↓	↓	↓
397-405	.9	↓	↓	↓

RUN NO.	MACH No.	α	δe	δr
406-414	.8	4	0°	-10°
415-423	.85	↓	↓	↓
424-432	.9	↓	↓	↓
433-448	.8	5	+10°	0°
449-464	↓	↓	↓	↓
465-468	.8	6	+10°	-10°
469-472	.85	↓	↓	↓
473-476	.9	↓	↓	↓
477	.9	+10°	0°	0°
478	.9	↓	↓	↓

NOTE:

(a) RUN 477 was run with dense particle trip strips on glider.

(b) RUN 478 was run with no trip strips on glider.

CALC	JS		REVISED	DATE	TRANSONIC WIND TUNNEL TEST CONDITIONS
CHECK					
APR					
APR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON

Figure 1.5-16
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Mach Number	Dynamic Pressure (psf)	Test Section Static Pressure (psia)	Total Temperature (°F)	Reynolds Number/ft x 10^6
0.5	315	1780	106	2.86
0.6	418	1660	117	3.19
0.7	523	1530	123	3.48
0.8	620	1390	120	3.76
0.85	667	1310	122	3.85
0.9	709	1240	126	3.91
0.95	746	1180	133	3.92
1.0	782	1110	137	3.95
1.1	839	982	147	3.94

TRANSONIC W/T TEST SECTION PARAMETERS
(Nominal Values)

Figure 4.5-2

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 1

Run No.	10	11	189	250	252	253	256	257	258	259	260	266	267	268
Mach No.	0.7	0.7	.7	.8	.8	.8	.8	.8	.8	.8	.8	.85	.85	.85
α	0	+10	+18	-10	+18	- 6	+ 3	+ 6	+10	+14	+18	+ 6	+10	+14
Δc_p	.012	.015	.02	.02	.078	.014	.01	.025	.06	.078	.038	.016	.048	.038
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	142.5	145	147.0	149.5	161.5	146.0	144.0	151.5	159.0	161.5	162.5	148	157.5	155.5
40			126.5		146.0				139.5	144	148.5		142.5	146.5
50			127.5		148.0				141.5	146	148.5		143.5	147
63					148.0				141.5	146.5	149.5		144	146
80	121.5	121.5	129.5		149.5			136	143	147.5	151	134.0	145.5	145.5
100	122	122	128		150.5		130.0	137.5	144	149	150	134.5	147	145.5
125	122.5	122.5	130		150.5		131	138	144.5	149.5	151.5	135.5	147.5	145
160	125	124.5	132	131.5	150.5	127.0	132.0	139	146.5	150	152	137.5	148	145.5
200	130	130	136	136.0	152.5	133.0	137.5	142	149.0	152.5	154	139.0	148.5	144
250	128	127.5	134	135.5	152.0	133.0	134.5	141	148.5	152	153	139.5	147.5	144
320	131.5	131.5	135	137.0	151.5	135.5	134.5	142	150	152.5	152	139.0	147	142.5
400	133.5	134	137	139.5	150.5	139.0	134.5	142.5	150.5	151.5	151.5	138.0	146.5	141.5
500	132	134	135.5	141.0	149.5	140.0	133.5	142	149	150.5	150.5	137.5	145	142
630	133	136	135	141.5	148.5	139.5	132.0	141	147	149	149	135.5	142.5	138.5
800	134	137.5	136	142.0	146.0	137.5	132	139.5	146	147.5	146.5	134.5	140.5	137
1000	133	136.5	137	142.0	143.0	132.0	131.0	137.5	143	145.5	144	132.5	138	134
1250	133	136	138.5	138.5	142.5		130.0	137	142	143.5	143.5	132.0	138	134
1600	132	134	136.5	134.0	142.5			135.5	141	143	143	130.0	137	132
2000			133.5	130.5	141.5			133	138	141	142			
2500			132.5	128.5	136.5					133	135			
3200										134.5	135			
4000														

Figure 1.5-3

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 1

Run No.	433	434	435	436	437	438	439	440	262	7				
Mach No.	.8	.81	.82	.83	.84	.85	.86	.87	.85	.6				
α	+10	+10	+10	+10	+10	+10	+10	+10	-6°	0°				
ΔC_D	.055	.06	.056	.056	.05	.044	.034	.0096	.0076	.0042				
fc / cps	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
Overall SPL	158.5	159.0	158.5	158.5	158.0	157.0	154.5	143.5	141.5	133.5				
40	140.5	141	141	141	142.5	141.5	143.5							
50	141	141	141.5	143	143.0	143	143.5							
63	141.5	141.5	142	142.5	143.5	143	143			117				
80	141.5	142.5	142	143	143.5	143.5	143.5	134.5		117				
100	144	145	144.5	144.5	146	147	144	136.5		118				
125	144.5	145.5	146.5	146	147.5	147.5	145	136		121.5				
160	146	146	147.5	148	148.5	148	145	134.5	131.5	123				
200	149	148.5	149.5	150	150	148	144.5	133.5	135	123.5				
250	148.5	148.5	149	150	148.5	147	143.5	132	135	125.5				
320	149	150	150	150	148	146	143.5	132	134	124.5				
400	151	150.5	149	148	147.5	146	142.5	131.5	133	126				
500	150	148.5	148	147	146.5	145	141	130	131	125				
630	147	147	146.5	145.5	144	142.5	139	127		125				
800	146	145.5	144.5	143.5	142.5	140.5	136.5							
1000	143	142.5	142	141	140	138.5	134.5							
1250	141.5	141.5	141	140	139	137.5	133.5							
1600	139.5	139.5	139	138.5	138.5	135.5	132							
2000	137.5	136.5	136	135	133.5	132.5								
2500	131.5	131.5	131	130.5	129.5	128.5								
3200														
4000														

Figure 4.5-14

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 2

Run No.	11	19	189	250	263	252	253	254	255	256	257	258	259	260
Mach No.	0.7	.9	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
	+10	0	+18	-10	0	+18	-6	-3	0	+3	+6	+30	+14	+18
α														
ΔC_D	.013	.061		.013	.015	.06	.014	.0115	.017	.0215	.032	.045	.05	.062
fc	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .002 MICROBAR													
cps / Overall SPL	143.5	160.5	148.0	145.5	147.0	159.0	146.0	146.5	148.0	150.0	153.5	155.5	159.2	162.5
40		144.5	128			142.5						136.5	139	144
50		146.5	129			142.5						137	139	143.5
63		147.5				144.0						138.5	140.5	144
80	122	150.0	130			145.0				133.0	135	139.5	141.5	144.5
100	122	150.0	130			145.0				132.5	136	140.5	143.5	145
125	123	150.0	131.5			145.0				133.5	138.5	142	144.5	146.5
160	124	149.5	132	127.0	131.0	145.0	128.5	129.0	131.5	135.0	138.5	143	145	146.5
200	129	150.0	135.5	131.0	137.0	145.5	133.0	135.0	137.0	136.5	141.5	144.5	147	147.5
250	127	149.5	134.5	131.0	132.5	147.0	132.5	133.0	135.0	136.5	140.0	144.5	146	146.5
320	130.5	150.0	134.5	132.0	130.0	147.5	133.5	133.5	134.0	137.0	140.5	145	147	147.5
400	132.5	149.5	135.5	135.0	135.5	147.5	136.0	135.5	135.5	136.5	141.5	147	147.5	148
500	132	149.0	136	135.5	136.0	147.5	136.5	136.0	136.0	138.0	142.5	148	148	148
630	133.5	148.0	137	136.0	136.5	147.5	137.0	136.5	137.0	139.0	143.5	146.5	147.5	147.5
800	134.5	148.5	139.5	137.5	138.0	148.0	138.0	138.0	138.5	140.5	144.0	147	148	148
1000	133.5	147.5	138	137.0	138.0	147.0	137.5	136.0	138.5	140.0	143.5	146.5	147	147
1250	133.5	148.0	138	136.5	138.5	146.5	137.0	137.5	139.0	140.5	143.0	145	146	146
1600	135	147.5	138.5	135.5	139.0	146.5	136.0	138.5	139.5	141.5	143.5	145	146	146.5
2000	132	148.0	137.5	133.0	136.5	147.0	133.5	134.0	137.0	140.0	142.5	145	147	146.5
2500		145.5	137		132.5	143.5			137.5	137.5	137.0	139.5	141.5	142.5
3200		144.5	136			139.5					134.5	136.5	138	139
4000		130.5												

Figure 4.5-5

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 2

Run No.	261	262	263	264	265	266	267	268	269	270	271	272	275	276
Mach No.	.85	.85	.85	.85	.85	.85	.85	.85	.85	.9	.9	.9	.9	.9
α	-10	-6	-3	0	+3	+6	+10	+14	+18	+10	-6	+3	+6	+10
Δc_p	.0145	.02	.022	.02	.027	.04	.047	.033	.025	.044	.04	.08	.09	.095
fc cps /	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
Overall SPL	147	150.0	151.0	150.0	152.5	156.0	157.5	154.5	152.0	157.5	156.5	163.0	164.0	164.5
40						137.5	142.0	142	136	145.5	143	152.5	155.5	152.5
50						138.5	143.0	141.5	137	146	143	153.0	155.0	154.0
63						139.0	143.0	142	137.5	145.5	144	153.0	154.5	155.0
80				133.0	136.5	139.5	143.5	141.5	138	148	146	153.0	155.0	156.0
100			130.5	133.5	136.5	140.0	145.0	142	138.5	147	146	153.5	153.5	154.0
125		131.0	132.5	135.0	138.0	141.5	145.5	142.5	140	148	146.5	152.0	152.5	154.5
160	128.0	130.5	132.5	135.5	139.0	143.5	145.0	142.5	139.5	148	146.5	152.0	151.5	153.5
200	131.0	132.0	133.5	135.5	139.5	145.0	146.0	142.5	139.5	148.5	146	151.5	152.5	154.0
250	131.5	133.0	135.0	135.5	139.0	145.0	145.0	141	140	147	144.5	151.0	151.0	153.5
320	133.5	137.0	139.0	138.5	140.0	145.0	145.5	142.5	141	145.5	144.5	151.0	150.5	154.0
400	136.5	141.0	141.0	139.5	141.5	145.0	146.0	143.5	142	143.5	145.0	149.5	150.0	154.0
500	138.5	143.0	142.5	140.5	141.5	145.5	146.0	143.5	142.5	142	145	150.0	150.0	152.0
630	139.0	142.0	141.5	139.5	141.5	145.5	145.0	143	142	141	144	149.0	148.5	150.5
800	139.5	142.0	142.0	140.0	142.0	145.5	145.0	143.5	142	140.5	144	146.0	148.0	148.5
1000	137.5	141.0	142.0	139.5	142.0	144.5	144.5	142.5	140.5	138.5	143.5	143.0	144.0	145.0
1250	136.0	139.0	142.0	140.5	142.5	144.5	144.5	141.5	139.5	138	143	141.0	141.0	142.0
1600	135.0	136.5	141.0	142.0	142.5	144.5	144.5	140.5	139.5	135	142	136.5	138.0	138.5
2000	132.0	136.5	137.0	138.0	140.0	142.5	144.0	138.5	137		136.5	133.0	134.0	135.5
2500			132.0	133.5	136.0	137.5	139.0	135.5	133.5					131.5
3200						135.5	136.0	134	133.5					129.5
4000														133.5

Figure 4.5-67

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 2

Run No.	133	134	135	136	137	138	139	140	141	142	143	177	178	7
Mach No.	.8	.81	.82	.83	.84	.85	.86	.87	.88	.89	.89	.9	.9	.6
α	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	0°
ΔC_p	.042	.044	.044	.042	.044	.04	.038	.031	.026	.05	.1	.1	.095	.005

C.2 THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR

fc cps / Overall SPL	156.0	156.5	156.5	156.0	155.5	156.0	155.5	154.0	152.5	158.5	165.0	165.0	164.5	133
40	135.5	136	136	138	138.5	139.5	144	140	138	146	151	151	153.5	
50	136.5	137	139	138	139	142	143.5	141	139	146.5	156	154.5	154	
63	137.5	138	139.5	138.5	140	141	144	142	140	147.5	155.5	155	153	
80	138.5	139.5	140	141	141	143	145.5	143	141.5	148	156	155	154	116
100	138	140	140	141	142	143.5	143.5	142.5	141	148	155	155.5	154	116
125	139.	142	141	141.5	143	143.5	143.5	142.5	141.5	147	154.5	154.5	154	116.5
160	142.5	143	143	143	144	144.	143.5	142.5	141.5	147.5	154.5	153.5	151	120
200	145	145	144	145	145.5	144.5	143.5	142.5	141.5	148	154	154	153.5	121
250	142.5	144.5	144.5	145.5	145.5	144.5	143	142	141	147.5	153.5	152	153	122.5
320	144	146	145	146	146	144.5	142.5	142	141	147.5	154	153	153.5	124
400	146	146	145	145.5	146	145	143	142	141.5	147.5	153.5	153	153.5	123.5
500	145	146	145.5	146	146	144.5	142.5	142	141.5	147	152.5	152.5	152.5	125.5
630	145	146	145.5	145.5	145.5	143.5	142.5	141.5	140.5	145	150.5	150.5	149.5	124
800	146	146	146	146	145.5	144.5	143	141.5	140	144	148.5	148.5	148	125
1000	145	145	145	145	144.5	143.5	141.5	140	138.5	145	151.5	145.5	144.5	
1250	144	145.5	145	144.5	144.5	143.5	141.5	139.5	137.5	142.5	149.5	142.5	141.5	
1600	144	146	146	145.5	145.5	144.5	141.5	139	136.5	139.5	147.5	139	138	
2000	144.5	146.5	146	145.5	145.5	144	140	137.5	135	136.5	145.5	138		
2500	139.5	140	139.5	139.5	139.5	139.5	136.5	134.5	132.5	131.5	142.5	132		
3200	136.5	136.5	136.5	136.5	136	135.5	133.5	132.5	131	129.5	139.5			
4000														

Figure 4.5-7

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 2

Run No.	433	434	435	436	437	438	439	440	441	442	443	477	478	7
Mach No.	.8	.81	.82	.83	.84	.85	.86	.87	.88	.88	.89	.9	.9	.6
α	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	0°
Δc_p	.042	.044	.044	.042	.044	.04	.038	.031	.026	.05	.1	.1	.095	.005
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
Overall SPL	156.0	156.5	156.5	156.0	156.5	156.0	155.5	154.0	152.5	158.5	165.0	165.0	164.5	133
40	135.5	136	136	138	138.5	139.5	144	140	138	146	154	154	153.5	
50	136.5	137	139	138	139	142	143.5	141	139	146.5	156	154.5	154	
63	137.5	138	139.5	138.5	140	141	144	142	140	147.5	155.5	155	153	
80	138.5	139.5	140	141	141	143	145.5	143	141.5	148	156	155	154	116
100	138	140	140	141	142	143.5	143.5	142.5	141	148	155	155.5	154	116
125	139	142	141	141.5	143	143.5	143.5	142.5	141.5	147	154.5	154.5	154	116.5
160	141.5	143	143	143	144	144.5	143.5	142.5	141.5	147.5	154.5	153.5	154	120
200	145	145	144	145	145.5	144.5	143.5	142.5	141.5	148	154	154	153.5	121
250	142.5	144.5	144.5	145.5	145.5	144.5	143	142	141	147.5	153.5	152	153	122.5
320	144	146	145	146	146	144.5	142.5	142	141	147.5	154	153	153.5	124
400	146	146	145	145.5	146	145	143	142	141.5	147.5	153.5	153	153.5	123.5
500	146	146	145.5	146	146	144.5	142.5	142	141.5	147	152.5	152.5	152.5	125.5
630	145	146	145.5	145.5	145.5	143.5	142.5	141.5	140.5	145	150.5	150.5	149.5	124
800	146	147	146	146	145.5	144.5	143	141.5	140	144	148.5	148.5	148	125
1000	145	145.5	145	145	144.5	143.5	141.5	140	138.5	141.5	145	145.5	144.5	
1250	144	145.5	145	144.5	144.5	143.5	141.5	139.5	137.5	139.5	142.5	142.5	141.5	
1600	144	146	146	145.5	145.5	144.5	141.5	139	136.5	137.5	139.5	139	138	
2000	144.5	146.5	146	145.5	145	144	140	137.5	135	134	136.5	138		
2500	139.5	140	139.5	139.5	139.5	139.5	136.5	134.5	132.5	131.5	131.5	132		
3200	136.5	136.5	136.5	136.5	136	135.5	133.5	132.5	131	129.5				
4000														

Figure 4.5-7

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 2

| | | |

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 3

Run No.	257	258	259	260	261	265	266	267	268	269	271	272	273	433
Mach No.	.8	.8	.8	.8	.85	.85	.85	.85	.85	.85	.9	.9	.9	.81
α	+6	+10	+14	+18	0	+3	+6	+10	+14	+18	-6	-3	0	+10
Δc_p	.022	.03	.047	.06	.019	.085	.042	.064	.074	.035	.022	.03	.017	.027
fc cps / Overall SPL	150.0	153.0	157.0	159.0	149.5	163.0	156.5	160.5	161.5	155.0	151.5	154.0	142.0	152.0
	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
40				142		141.0		144.0	151.0				136.5	131
50				142.5		144.0		145.5	151.0				138.0	132.5
63				143.5		145.0		146.5	150.5	141.5			137.5	134
80			141.5	145.5		145.0	140.0	147.5	150.0	142.5		136.0	140.0	134.5
100		135	141.5	144.5		145.0	140.0	147.0	149.0	141.5		135.0	138.0	134.5
125		136	142	146		145.5	141.0	147.5	148.5	142.0		136.0	136.5	135.5
160	131.5	136.5	142.5	146	132	146.0	142.5	148.5	[illegible].5	141.0	134.0	137.5	138.0	136.5
200	134.5	138.5	144.5	147.5	135.5	147.5	143.5	149.0	.5	143.0	137.0	138.5	138.5	137.5
250	135	138.5	144.5	147.5	136.5	149.0	144.5	149.0	5	143.0	137.5	139.0	138.0	137
320	137.5	141	146	148	137	151.0	145.0	149.0	.5	143.5	138.0	140.0	135.0	139
400	140	143.5	146.5	148	138.5	151.0	145.0	149.0	148.0	144.0	138.5	140.5	134.5	142.5
500	140.5	143.5	147	148	138.[illegible]	151.0	145.5	149.0	148.0	144.0	139.0	141.0	135.5	143
630	139.5	143	147	147.5	137.5	151.0	145.0	148.0	147.0	144.0	139.5	141.5	135.0	142
800	140	144	147	147.5	138	151.5	146.5	148.0	147.5	144.5	141.5	142.5	135.5	143
1000	140	143.5	146	147	138.5	152.0	145.0	147.5	146.5	143.5	143.5	144.0	136.0	142
1250	141	143	145	146	140	153.0	145.0	147.0	146.5	143.0	145.0	147.0	136.0	141
1600	142	143	146	147	143.5	155.0	146.0	147.5	147.0	143.0	144.0	147.5	137.5	140.5
2000	140	142.5	146	148	140.5	153.0	145.0	147.5	146.5	142.5	139.0	141.5	138.0	140.5
2500			144	145.5		149.5	143.0	145.0	144.5				136.0	
3200														
4000														

Figure 4.5-9

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 3

Run No.	434	435	436	437	438	439	440	441	442	443	477	478		
Mach No.	.81	.82	.83	.84	.85	.86	.87	.88	.88	.89	.9	.9		
α	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10		
Δc_p	.035	.037	.04	.044	.052	.058	.041	.025	.021	.018	.02	.018		
fc cps /	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
Overall SPL	154.0	155.0	156.0	157.0	158.5	159.5	156.5	152.0	150.5	149.0	150.5	149.5		
40	134	136.5	138	140.5	142	149	145	138	136	135	134.5	131.5		
50	134	138	139	141	143.5	148	145	139	136	135.5	135.5	132.5		
63	135	138.5	139.5	142	144	148	146	138.5	136	134.5	135	133		
80	135.5	138	140	142	144	148	145	139	137.5	134.5	135.5	133.5		
100	137.5	138.5	140.5	143.5	145.5	148.5	146.5	140	138	135.5	135.5	134.5		
125	139	140	143	144	146.5	148.5	147	140	137.5	136	135.5	135.5		
160	140	141	143.5	145	146.5	148	146	139.5	137	136	136	135.5		
200	139	142.5	144.5	145.5	147	148	145	139.5	137.5	137	136.5	136		
250	140	142	144.5	145	147	146.5	143.5	139	137.5	136	136.5	136.5		
320	143	144.5	145.5	146.5	147	147.5	144	140	138	137.5	137.5	138		
400	144.5	145	146	147	147.5	147.5	144	140.5	139.5	138.5	138	139		
500	144	145	146	147	147	147	144	141	140	139.5	139	139.5		
630	144	145	146	146	146	146	143	141	140	139.5	139	139.5		
800	144.5	145	145.5	146	146	146.5	143	141	140	140	139	139.5		
1000	143.5	144	144.5	145.5	145.5	145.5	143	140.5	139.5	139	140	139.5		
1250	142.5	143.5	144	144	144.5	144.5	142	140	138.5	138	139.5	138.5		
1600	142.5	143	144	144.5	144.5	144.5	142	140.5	139		138.5	137.5		
2000	142.5	143.5	144	145	145	144.5	142.5	140.5	138.5		138.5			
2500											142			
3200														
4000														

Figure 4.5-10

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 4

Run No.	259	260	10
Mach No.	.8	.8	.7
α	+14	±18	0°
Δc_p	.013	.015	.006
fc cps / Overall SPL	145.5	147.0	137
40			
50			
63			
80			
100			
125			
160	132.5	133.5	122
200	135.0	136.5	127.5
250	133.5	135.5	125.5
320	134.0	136.0	128
400	135.5	137.0	131
500	136.0	137.0	128.5
630	136.0	137.5	129
800	136.0	138.0	128.5
1000	135.5	137.5	
1250	135.5	137.5	
1600	135.5	137.0	
2000		137.0	
2500			
3200			
4000			

ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR

Figure 4.5-11

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 5

Run No.	412	413	414	421	422	423								
Mach No.	.8	.8	.8	.85	.85	.85								
α	+10	+14	+18	+10	+14	+18								
Δc_p	.0092	.011	.014	.009	.011	.01								
fo cps / Overall SPL	142.5	144.0	146.0	143.0	145.0	143.5								
	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
40														
50														
63														
80														
100														
125														
160	130	131	132	131.0	133.0	132.0								
200	133	133	135.5	133.0	135.0	137.0								
250	131.5	133	135.5	133.5	135.0	135.5								
320	133	133.5	136	133.5	135.0	133.0								
400	133.5	134.5	136	133.0	135.0	133								
500	132.5	134	137	133.0	136.0	134								
630	134	135	137.5	134.0	136.0	134								
800	134	135.5	138	134.0	136.0	134								
1000	131	134	136	132.5	134.0	130								
1250	129	131.5	133.5	130.5	131.5									
1600														
2000														
2500														
3200														
4000														

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 6

Run No.	251	255	256	257	258	261	262	263	264	265	270	271	133	134
Mach No.	.8	.8	.8	.8	.8	.85	.85	.85	.85	.85	.9	.9	.8	.87
α	-10	0	+3	+6	+10	-10	-6	-3	0	+3	=10	-6	+10	+10
Δc_p	.021	.024	.026	.023	.019	.018	.03	.042	.03	.015	.024	.04	.016	.014

ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR

fc cps / Overall SPL	150.0	151.0	151.5	150.5	149.0	149.0	153.5	155.5	153.5	147.5	152.0	156.5	147.5	146.0
40								141.5	139.5			141.0		
50								142.0	140.0			142.5		
63							139.5	141.5	140.0	134.0	138.0	143.5		
80				130.5	129.0	131.0	137.5	143.5	141.0	136.0	138.5	144.0	133.5	
100	130.5	137.5	132	132.5	131.5	132.0	139.5	141.5	142.5	137.5	138.5	145.0	139.5	133.5
125	132.5	133.5	133.5	134.5	134.0	134.5	141.0	144.5	144.5	139.5	141.5	146.5	137.5	138
160	133.5	135	135	139.0	139.5	137.0	144.5	147.0	145.5	141.5	141.5	146.0	138	137.5
200	141.5	142.5	141.5	138.5	138.0	138.5	145.0	148.5	144.5	139.0	141.5	146.0	142.5	138.5
250	138.5	139.5	139	139.5	139.5	140.0	145.5	147.0	143.0	138.5	142.0	146.0	138	140
320	138.5	139.5	140	142.5	143.0	142.0	146.0	147.5	143.5	138.5	142.5	146.0	142.5	136.5
400	141.0	142.5	143.5	143.0	141.5	141.5	144.5	146.0	142.5	138.0	143.0	146.0	140	135.5
500	141.5	142.5	143.5	143.0	141.5	141.0	142.0	144.0	142.5	137.5	143.0	145.5	138	
630	141.5	142.0	143.5	143.0	139.0	139.0	140.5	143.0	141.0	137.0	143.0	145.5		
800	141.0	142.0	143.5	141.5	137.5	137.5	139.5	143.0	140.0		142.0	144.5		
1000	140.0	140	141	138.5	135.5							145.5		
1250														
1600														
2000														
2500														
3200														
4000														

Figure 4.5-13

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 6

| Run No. | 70 | | |

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 7

Run No.	9	10	11	250	251	252	253	254	255	256	257	258	259	260
Mach No.	0.7	0.7	0.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
α	-10	-10	+10	-10	0	+18	-6	-3	-30	+3	+6	+10	+14	+18
Δc_p	.015	.014	.016	.011	.013	.025	.011	.013	.013	.015	.015	.016	.022	.024
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	144.5	144.0	145.5	144.0	145.5	151.5	144.0	145.5	145.5	146.5	146.5	147.5	150.0	151.0
40	120.5	120	122.0											
50	121		122.0											
63			122.0											
80	122	121	122.0	125.5	127	129	125.5	125	126.5	126.5	124.5	126.0	128.0	128.0
100	121.5	121.5	122.5	124.5	126.5	130.5	123.5	124.5	126	127	124.5	127.5	128.5	130.0
125	122	122.5	123.0	125.5	127.5	132	124	125.5	128	128	128.5	129.5	131.5	133.0
160	124.5	124.0	124.5	126.5	127	135	127	127	128	128.5	129.0	131.0	132.5	135.5
200	127.5	128.0	130.0	131.5	136	138	132	134	135.5	135	134.0	135.5	136.5	137.5
250	127	127	128.0	130.5	132	141.5	131	131	132	133	132.5	134.0	136.5	140.5
320	129	130	132.0	131.0	133	147	132	132	133.5	134	134.0	136.0	138.5	146.0
400	132	132.5	134.5	134.0	135.5	145.5	133.5	134.5	136	136.5	137.5	139.0	142.0	145.0
500	131.5	132	134.0	134.5	136	140	134.5	135.5	136	137	138.0	140.0	144.5	140.5
630	133.5	134.5	136.0	135.5	137	138.5	136	136	136.5	137.5	138.0	140.0	142.0	138.0
800	134.5	135	136.5	136.5	137	137	136	136.5	136.5	137	138.5	139.0	137.5	137.0
1000	136.5	136	137.0	138	137	138	137.5	137.5	137	137	136.5	137.5	136.5	137.5
1250	138	137	138.5			140		138	137.5	138	137.5	138.0	138.5	139.5
1600	128	126.5	128.5			136.5				130.5				
2000	129	128.5	131.0							131.5				
2500	130	130.5	133.0											
3200	130.5	128.5	130.5											
4000														

Figure 4.5-15

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 7

Run No.	262	263	264	265	266	267	268	269	275	276	277	278	433	434
Mach No.	.85	.85	.85	.85	.85	.85	.85	.9	.9	.9	.9	.9	.8	.81
α	-6	-3	0	+3	+6	+10	+14	+18	+6	+10	+14	+18	+10	+10
ΔC_D	.0085	.0085	.01	.011	.013	.016	.024	.03	.0095	.012	.012	.019	.017	.017
fo / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
Overall SPL	142.5	142.5	144.0	145.0	146.0	148.0	151.5	154.0	144.0	147.0	146.5	150.0	148.0	148.0
40								134				141		
50								138				140		
63								139.5			135.5	140.5		
80	125.5	126.0	125.5	127.0	128.5	130.0	132	132	131	136	137	141		
100	125.0	126.0	128.0	129.0	129.0	130.5	134	144	132.5	138	138.5	141		
125	128.0	127.5	129.0	130.5	131.5	133.0	136.5	146.5	132.5	136.5	138.5	140		
160	128.5	128.5	130.5	132.0	133.5	134.0	137	147	133.5	137.5	137.5	137	130.5	131.5
200	130.5	131.5	133.0	133.5	135.5	137.5	144	148	133.5	138.5	135.5	135.5	135.5	135.5
250	130.5	131.5	132.5	133.0	135.5	138.5	147.5	144.5	134.5	139	133	133.5	134.5	135
320	130.5	132.0	133.0	135.0	136.0	139.5	145.5	140	135	138	131.5	133	135.5	136.5
400	132.5	134.0	135.0	136.5	137.5	141.0	141	137.5	135	136	131.5	132	139	139.5
500	133.5	134.5	135.5	137.0	138.0	139.0	138.5	136	135	135.5	133	132.5	139.5	140
630	133.5	134.5	135.5	136.0	137.0	137.0	135.5	134	132	132	129	131.5	139	139
800	133.5	133.5	134.0	134.5	135.5	135.5	134.5	132.5	131	131	130.5	132.5	138	138
1000	134.5	134.0	134.0	134.5	135.0	138.0	135.5	133.5	132	132.5	132	133	138	137.5
1250												136.5	141.5	140.5
1600													131.5	131.5
2000													132.5	132
2500													131	130.5
3200														
4000														

Figure 4.5-16

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 7

Run No.	135	136	137	138	139	140	141	142	143	144	145	147	148	177
Tech No.	.82	.83	.84	.85	.86	.87	.88	.88	.89	.9	.93	.94	.95	.9
OK	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10
Δc_p	.017	.017	.017	.017	.017	.017	.015	.016	.013	.01	.009	.0076	.0078	.014

fo cps / Overall SPL — 1/3 OCTAVE BAND SOUND PRESSURE LEVELS - RE: .0002 MICROBAR

fo cps	Overall SPL	148.0	148.5	148.5	148.0	148.0	146.5	144.5	143.5	142.0	142.5	147.5
40												
50												
63												
80												
100												137
125					133	133.5	135.5	136.5	135.5	135				137
160	132.5	133	134	134.5	134.5	136	136	137.5	135.5	133.5	129.5	127	130	137
200	136.5	136.5	136.5	137.5	135.5	138.5	138	138.5	136.5	134.5	130.5	128	130.5	138.5
250	135.5	136.5	137	137.5	137.5	138.5	138	138.5	138.5	134.5	130.5	128.5	130	140
320	137	137.5	138	138.5	139	139.5	140.5	140.5	139	134	130	128.5	130	137.5
400	140	139.5	140.5	140.5	141	141	140.5	138.5	136	133.5	130.5	128.5	129.5	137.5
500	140	140	140.5	140.5	139.5	139.5	138.5	137.5	136.5	133.5	133	131.5	130.5	137.5
630	139	139	139	139	138.5	137	136	134	132	129.5	128	127	127	133
800	137.5	137.5	137	136.5	135	133.4	132	131.5	130.5	129				131.5
1000	137	136.5	136	135.5	134.5	134	133	133	132.5	132	132.5	133	133	133
1250	140.5	139.5	139.5	140	139.5	138.5	138.5	13815	138	138.5	140.5	139.5	139.5	138.5
1600	131.5	131.5	131	130.5	129.5	128.5	127	125.5			125	126	126	126
2000	131.5	131	131	130.5	129.5									
2500	130.5	130	130	130	129									
3200														
4000														

Figure 4.5-17

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 7

Run No.	473	369	390													
Mach No.	.9	.7	.6													
α	+10	+18	+18													
Δc_p	.014	.022	.014													
fq / cps	OCTAVE AND THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR															
Overall SPL	147.0	148.0	144.0													
40		124	118													
50		124														
63		124	119.5													
80		123	119.5													
100	137	125	120													
125	136.5	127	123													
160	137	132	124.5													
200	139	130	124													
250	138.5	132	127													
320	137	135.5	128													
400	137	137	131													
500	132.5	139.5	131.5													
630	131	140	134.5													
800	133	137.5	136.5													
1000	138.5	139.5	137													
1250	135.5	131	130													
1600		135	130													
2000		135	132													
2500		134	132													
3200		135	133.5													
4000																

Figure 4.5-18

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 9

Run No.	5	6	7	8	9	10	83	330	331	332	333	336	337	338
Mach No.	0.5	0.6	0.6	0.6	0.7	0.7	.95	.8	.8	.8	.8	.85	.85	.85
α_K	+10	+10	0	-10	-10	0	+6	+6	+10	+14	+18	-3	0	+3
Δc_p	.072	.06	.017	.018	.031	.031	.04	.02	.02	.024	.023	.011	.013	.016
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	144.0	145.0	144.0	144.5	151.0	151.0	156.5	149.5	142.5	151.0	150.5	144.5	146.0	148.0
40	128	131			128	128.5	148							
50	129	130			129	129.5	147.5							
63	129.5	131	125	125.5	129.5	130	145				139.5			
80	131	131.5	125.5	125.5	130	130	145	134.0	135.5	133.5	140.5	130.5	131.0	132.0
100	131	133	126	125.5	129	130	144	134.0	135.0	134.0	139.0	130.0	131.5	131.5
125	132.5	133.5	127	127	129.5	131.5	143	134.5	137.0	136.5	130.5	131.5	132.0	133.0
160	132	134.5	130.5	129	131	132.5	142.5	134.5	137.5	137.5	140.0	132.0	133.5	135.5
200	134	136	130	129	135	136	142.5	136.0	141.5	131.5	141.5	134.0	136.0	136.5
250	134.5	136.5	132	130	133.5	135	141.5	134.5	137.5	141	143.0	134.0	134.5	136.5
320	135	137.5	132.5	133.5	135	136.5	139	132.5	134.5	139.5	141.5	131.0	133.0	135.0
400	139	141	136.5	137.5	142	142	141	138.0	138.0	142	140.0	136.5	133.0	139.5
500	143.5	145.5	140.5	141	143.5	144	146.5	143.0	141.0	147.0	139.5	140.5	141.0	143.0
630	137.5	138.5	134	134	138.5	139.5	140.5	139.0	138	139.0		133.5	134.5	136.5
800	143	144.5			144.5	145	147	144.5	145	142.5				141.0
1000	142	143			141.5	141.5	145.5							
1250	141.5	142.5			139	138.5								
1600	146	147			142	142								
2000	147.5	146.5												
2500	146.5	147												
3200														
4000														

Figure 4.5-19

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 9

Run No.	339	340	341	342	346	347	348	349	439	440	445	478		
Mach No.	.85	.85	.85	.85	.9	.9	.9	.9	.86	.87	.92	.9		
α	+6	+10	+14	+18	0	+3	+6	+10	+10	+10	+10	+10		
Δc_D	.019	.025	.029	.044	.01	.013	.028	.019	.017	.013	.014	.013		
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	149.5	152.0	153.0	157.0	144.5	146.5	153.5	150.0	148.5	146.0	157.5	146.5		
40				142.5							150.5			
50				145.5							150.0			
63			140.0	147.5			142.0	140.5			149.5			
80		139.5	141.0	148.5	134.5	136.0	145.0	142.0			149.5			
100	136.5	139.5	141.5	149.0	134.5	136.0	145.5	142.5			149.0			
125	137.0	140.0	141.5	149.5	133.5	135.0	144.5	142.5	140.0		146.0	141.5		
160	136.5	138.0	141.5	148.5	133.0	135.5	144.5	141.0	138.5	139.5	142.0	139.5		
200	137.5	140.5	146.5	149.0	132.5	135.0	14315	140.0	138.0	138.0	139.5	138.5		
250	137.0	139.5	145.5	145.5	132.5	135.5	141.0	137.5	137.0	136.5	136.0	135.5		
320	135.0	136.0	138.0	138.5	132.0	135.0	137.5	132	135.0	135.5	131.0	131		
400	140.0	141.0	139.5	138.5	135.5	138.5	138.5	133	138.5	137.0	132.0	133.5		
500	144.0	144.0	142.5	140.0	139.0	141.0	143	136.5	140.0	139.0	135.5	137		
630	138.0	138.5	137.0	133.5	132.0	133.5	136.5	132.5	137.0	136.0		132.5		
800	143.0	145.0	143.0				143		142.5					
1000		143.0												
1250														
1600														
2000														
2500														
3200														
4000														

Figure 4.5-20

ACOUSTIC TEST R[illegible]S - SOUND PRESSURE LEVELS

Transducer Location: 10

Run No.	11	252	259	260	267	268	269	276	277	433	434	435	436	437
Mach No.	0.7	.8	.8	.8	.85	.85	.9	.9	.9	.8	.81	.82	.83	.84
α	+10	+10	+14	+15	+10	+14	+18	+10	+14	+10	+10	+10	+10	+10
Δo_5	.016	.014	.013	.014	.013	.016	.013	.015	.01	.0084	.0088	.0095	.0095	.0095

fo cps / Overall SPL

ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR

fo cps	Overall SPL	115.5	116.5	115.5	116.0	116.0	116.0	118.0	116.5	119.0	119.5	122.5	122.0	123.0	123.0
40	123.5					135.0				139.0	136.0				
50	123.5					136.5				138.5	136.0				
63						135.5				137.5	136.0				
80	124.5		134	131.0	134.0	137.0	133.5	134.5		135.5	134.5				
100	124.5		135	131.0	133.5	135.5	133.5	132.5		137.5	136.0				
125	126.5		135.5	133.5	134.5	137.0	135.5	134.5		135.5	134.5				
160	128		134	134.5	134.5	136.0	139.0	139.5		135.5	134.5	133.0	133.0	134.5	135.0
200	131.5		138	139.5	140.5	136.0	142.5	142.0		136.0	133.5	136.0	136.5	137.0	135.5
250	130		140.5	137.5	140.5	135.5	141.0	140.0		134.0	131.0	133.5	134.5	135.0	134.5
320	130.4		135.5	135.0	135.0	133.0	138.0	134.0		132.0	127.0	132.0	131.0	131.5	132.5
400	129.5		138	133.5	137.5	133.0	134.5	130.5		133.0	128.5	131.0	131.0	131.0	131.0
500	129		135.5	136.0	134.0	136.5	133.0	130.0		130.0	132.5	131.0	132.0	133.5	134.0
630	129		132	136.5	132.0	136.5	133.0			130.0	133.5	133.5	134.5	135.5	136.0
800	131									141.0	133.5				
1000	131.5														
1250	131.5														
1600	132.5														
2000	134														
2500	133.5														
3200	135.5														
4000	140.5														

Figure 4.5-21

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 10

Run No.	177																								
Basic No.	.95																								
α	+10																								
Δc_p	.012																								
fo cps	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR																								
Overall SPL	146.5																								
40																									
50																									
63																									
80																									
100	140																								
125	138																								
160	139																								
200	138.5																								
250	135.5																								
320	135																								
400	130																								
500																									
630																									
800																									
1000																									
1250																									
1600																									
2000																									
2500																									
3200																									
4000																									

Figure 4.5-22

AERODYNAMIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 11

Run No.	126	158												
Mach No.	.85	.9												
α	+10	0												
Δc_p	.0076	.004												
fc / cps	OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
Overall SPL	141.5	157.5												
40		143.5												
50		143.5												
63		144.0												
80		145.0												
100		145.0												
125	133.5	143.5												
160	135	144.0												
200	131.5	145.0												
250	130	146.0												
320	129	146.0												
400	133	147.5												
500	133.5	150.0												
630		146.5												
800		146.0												
1000		144.0												
1250														
1600														
2000														
2500														
3200														
4000														

Figure 4.5-23

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 12

Run No.	9	250	251	253	254	255	257	261	262	264	265	266	267	268
Mach No.	0.7	.8	.8	.8	.8	.8	.8	.85	.85	.85	.85	.85	.85	.85
α	-10	-10	0	-6	-3	0	+6	-10	-6	0	+3	+6	+10	+14
Δc_D	.002	.017		.016	.014	.013	.01	.018	.016	.013	.011	.011	.0095	.009

fo cps / Overall SPL	ONE THIRD	BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR											
Overall SPL	140.5	147.5	0	147.5	146.0	145.5	143.5	149.0	148.0	146.0	144.5	144.5	143.5	143.0
40														
50														
63	123.5							136	132.5					
80	123.5	132		131	127.5	128.5		136.5	133.5	130.5	130.5	130.5	130.0	
100	123.5	130.5	128	130	127	128	127	136	133	132.0	132.0	130.5	130.0	129.5
125	124.5	132.5	129.5	131.5	128.5	129	129.5	139	135.5	133.5	133.0	132.5	131.5	132.0
160	126.0	133	128.5	132	129.5	129	129.5	139	135.5	136.0	135.0	134.5	132.5	132.0
200	129.5	138	136.5	135	135	135.5	133	141	138.5	138.0	136.0	135.0	134.0	134.5
250	127.5	135.5	133	132	133.5	133	131	137.5	137	135.5	134.0	133.0	132.5	133.0
320	129.0	133.5	132	131.5	133.5	132.5	130.5	132.5	134.5	132.5	131.5	130.5	130.5	129.5
400	133.0	137	136	138	137	135.5	135.5	134.5	135	134.0	133.5	133.0	132.5	132.5
500	133.5	139.5	137.5	141	138.5	137.5	138	139	140.5	138.5	138.0	137.5	136.5	137.0
630	135.0	141.5	137.5	140	139	138	136	139.5	140	139.0	137.0	137.0	136.5	135.5
800		140		141.5	139	138		140	140					
1000														
1250														
1600														
2000														
2500														
3200														
4000														

Figure 4.5-24

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 15A

Run No.	113	114	115	116	117	118	119	120	121	122	123	124	125	126
Mach No.	.8	.8	.8	.8	.8	.8	.8	.85	.85	.85	.85	.85	.85	.85
α	-10	-6	-3	0	+3	+6	+10	-10	-6	-3	0	+3	+6	+10
Δc_p	.016	.015	.015	.015	.012	.012	.012	.015	.015	.015	.014	.011	.011	.015
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	147.5	146.5	146.5	146.5	145.0	145.0	145.0	147.5	147.0	147.0	146.5	144.5	145.0	147.0
40	138	137.0	137.0	138.0	136.0	135.5	136.0	138.5	138.5	136.5	137.0	136.0	136.0	138
50	136.5	136.5	136.5	137.5	136.5	135.0	135.5	138.0	136.5	137.0	137.5	135.0	136.5	138.5
63	137.5	137.0	136.0	136.5	135.0	135.0	135.0	137.5	136.0	137.5	137.0	135.0	134.5	138
80	137.0	136.0	136.5	136.5	135.0	135.5	135.5	137.5	137.0	137.0	136.5	135.5	135.5	138.5
100	136.5	136.0	135.0	136.0	136.5	135.0	135.0	137.0	136.0	135.5	136.0	134.5	135.0	137.5
12[illegible]	136.0	136.0	135.5	135.5	135.0	135.0	135.0	136.5	135.5	136.0	136.0	134.0	135.0	137.5
16[illegible]	135.5	135.0	135.5	135.5	134.0	134.0	134.0	136.5	135.5	135.5	136.0	133.5	134.0	137
200	135.0	135.0	135.0	135.5	134.5	134.0	133.5	136.0	135.5	135.5	135.0	133.0	134.0	136
250	134.0	134.0	133.5	134.0	132.5	132.0	132.5	134.5	134.0	133.5	134.0	132.5	132.0	133.5
320	134.0	135.0	135.0	135.0	134.0	132.0	132.5	133.5	134.0	133.5	133.5	132.0	131.5	133.5
400	140.0	139.0	138.0	135.0	133.5	133.0	134.0	138.0	139.0	138.0	134.5	132.5	133.0	136
500	[illegible]5	[illegible]0	131.5	131.0	130.0	130.0	132.5	133.5	132.0	132.0	131.0	129.5	[illegible].5	131
630	131.0	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]5	[illegible]5	[illegible]5	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]5	130.5
800	130.0	[illegible]5	[illegible]0	[illegible]5	[illegible]0	[illegible]0	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5
1000	128.0	[illegible]5	[illegible]7	[illegible]0	[illegible]5	[illegible]0	[illegible]0	[illegible]0	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]5	[illegible]3
1250	127.5	[illegible]5	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5
1600	127.5	[illegible]7	[illegible]0	[illegible]5	[illegible]0	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]3
2000	125.5	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]1
2500	[illegible]8.5	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]3.5
3200	[illegible]0	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]3.5
4000	[illegible]0	[illegible]5	[illegible]0	[illegible]0	[illegible]5	[illegible]0	[illegible]5	[illegible]5	[illegible]0	[illegible]0	[illegible]0	[illegible]0	[illegible]0	[illegible]3.5

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 15A

Run No.	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Mach No.	.9	.9	.9	.9	.9	.9	.9	.95	.95	.95	.95	.95	.95	.95
α	-10	-6	-3	0	+3	+6	+10	-10	-6	-3	0	+3	+6	+10
Δc_p	.018	.018	.015	.014	.014	.013	.013	.018	.017	.016	.016	.015	.014	.012
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	149.5	149.5	148.5	148.0	147.5	147	147	150	149.5	149	149	148.5	148	146.5
40	139.5	140	138	139	139	138	138	140	139	138.5	137.5	138	137.5	136.5
50	140	140	139	138.5	139	138	138	140	140	140	139.5	139.5	139.5	137.0
63	139	139	139	138	138.5	138	138	139	139.5	139	139	139	138.5	137.0
80	140	139.5	139	138.5	138	138	137	139.5	139.5	139	139	139	138.5	136.5
100	139	139	139	138	138	137	137.5	139.5	139.5	138	138.5	138	138	135.5
125	138.5	138.5	138	137.5	137.5	137	137.5	139.5	138.5	139	139	138	138	136.5
160	133	137.5	138	137.5	137	137	136.5	139	138.5	138	138	138	138	136.0
200	136	138.5	137	137	137	136.5	135	139	138.5	138	138	138	138	136.0
250	136	136	135	135.5	135	135	134.5	137.5	136	136	137	137	136.5	135.0
320	135.5	135.5	135.5	135	134.5	133	133.5	136	135	135.5	136.5	136	135.5	133.5
400	140.5	140.5	138	136	135	133.5	135.5	140.5	141	140.5	138.5	136.5	135	134.0
500	136	134.5	133	133	133.5	131.5	134.5	136.5	136	134.5	134.5	134	133	132.5
630	134	132.5	134.5	134.5	134	130	129.5	135	133.5	133	133	132.5	132	131.0
800	132	131	130.5	130	130	129.5	130	133	132	131	131.5	131.5	131	130.0
1000	129.5	129	128.5	128	128	128	128	130	130	129	129.5	129.5	129.5	128.5
1250	129	128	128	127.5	127	126.5	127	129	128.5	128.5	129	128.5	128.5	127.5
1600	128.5	128	128	128	127.5	127	128	128.5	128	128	128.5	128.5	128	127.5
2000	127	126.5	126.5	126	126	125.5	126	127.5	126.5	126.5	127	127	127	127.0
2500	129.5	128.5	129	128.5	128	128	130	130.5	128.5	128	129.5	129	129	129.5
3200	126	126	126.5	126	126	127.5	128	130.5	127.5	127.5	127.5	126.5	127	127.0
4000	133.5	132	133	133	132.5	132.5	134	132.5	131	131.5	131	133	133.5	134.0

Figure 4.5-26

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 15B

Run No.	196	1[illegible]	200	201	202	203	204	205	206	207	208	209		
Mach No.	1.1	.95	1.0	1.0	.95	.95	.95	.9	.9	.9	.85	.85		
q														
Δc_p	.011	.016	.013	.019	.015	.015	.01	.011	.017	.024	.021	.016		
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	146.5	149	147.5	151	148.5	148.5	145	145	149	152	150.5	148		
40	135.0	135.5	133.0	137.5	132.0	136.5	132.5	133	137.5	136.5	137.5	135		
50	134.5	136.5	134.5	138.5	133.5	137	133	132.5	138	138	137.5	136		
63	134.5	137	136.0	138.5	133.5	136.5	133	132.5	137.5	137.5	137.5	136.5		
80	134.5	138	137.0	138.5	134.5	137.5	133.5	133.5	138	138	138	138		
100	134.5	138.5	137.0	138.5	134.5	138.5	133	133	138.5	138	138	138		
125	134.5	139.5	137.0	139.0	135.0	139	133	133	139	138	139	138.5		
160	134.5	138.5	137.5	139.5	136.5	138.5	133	133	138.5	139.5	139	138		
200	135.5	140	137.5	140.0	137.5	138.5	133.5	133.5	139	140	140	136		
250	135.5	139.5	136.0	140.0	137.0	138.5	134.5	133	138	140	138.5	137		
320	135.5	139	136.5	140.0	137.5	138.5	135	134.5	138	140.5	138.5	138		
400	136.5	140	137.5	140.5	139.5	138	135.5	135	138.5	142	141	139		
500	136.5	137	137.5	143.0	141.0	136.5	136.5	136	137	146.5	144.5	136		
630	136.0	134		139.5	138.5	132.5	133	133	133	139.5	136.5			
800				134.5	133.0					135.5	134			
1000				137.0	135.0					137	136			
1250				136.0	134.0					135.5	134			
1600														
2000														
2500														
3200														
4000														

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 15B

Run No.	210	211	212	213	214	215	216	217	218	219	220	221	222	449
Mach No.	.85	.8	.8	.8	.7	.7	.7	.6	.6	.6	.5	.5	.5	.8
α_k	-10	-10	0	+18	+18	0	-10	-10	0	+18	+18	0	-10	+10
Δc_g	.01	.011	.017	.023	.023	.02	.014	.013	.014	.02	.018	.016	.01	.018
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	144	144	148	150.5	148.5	147	144	142	144	145.5	142	141	138.5	148.5
40	131	129	133.5	137	133	132	128.5	126	129	129.5	127	128	126	135.5
50	131.5	131	134.5	137.5	134.5	132.5	129.5	127.5	129.5	130	128.5	128	126	136
63	131.5	132.5	135.5	137	134	133.5	130	127.5	130.5	131.5	129	129	126	137
80	132	132	136.5	138	135.5	133	131	129	131.5	132	129	129	126.5	136.5
100	132	132	136.5	137.5	135	133.5	130	129	130.5	132	128.5	128.5	127.5	137.5
125	132.5	132	136.5	137.5	135.5	133.5	130	129.5	131.5	132.5	129	129	127.5	138.5
160	132.5	132	137	138	135	134	131	129.5	132	132.5	129	131.5	129	138
200	134	134	138.5	138.5	136	136.5	134	132.5	135	133	131.5	136	132	137.5
250	133.5	133.5	137.5	138	135	137	133.5	131.5	135.5	134	133	132	129	135.5
320	134.5	135	137.5	138	136.5	138	133.5	132	134.5	136	134.5	129.5	128.5	137
400	135	135.5	139	142	143	138.5	135.5	132	133	139	130	128.5	127.5	141
500	135	135	136	145	141	136	134.5	132	133	134	129.5	128.5	128	138
630	135.5	134	133	136	134.5	132	132	129	130.5	132.5	130.5	127	127	135
800	135.5	134	132.5	133.5	131.5	128.5	129.5	126	126.5	128.5	125.5	123.5	123	133.5
1000	135.5	134.5	131	136	134	131	131.5	128	128.5	130.5	127	126.5	125.5	133.5
1250	135.5	134	130	134.5	132.5	129.5	130	127.5	128.5	130	126.5	126	125	132.5
1600	135	134.5	130.5	134	132.5	129.5	129.5	127.5	128	129.5	126.5	125.5	124.5	132.5
2000	134.5	134	130.5	133.5	132	129.5	129	127.5	127.5	129	126.5	125.5	124.5	132
2500	134.5	133.5	130	133	131.5	129	128.5	127	127	128.5	126	125.5	124.5	131.5
3150	134	133	129.5	132.5	131	128.5	128	126.5	126.5	128	125.5	125	124	131
4000	134	132.5	129	132	130.5	128	127.5	126	126	127.5	125	124.5	123.5	130.5

Figure 4.5-28

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 15B

Run No.	450	451	452	453	454	455	456	457	458	459	460	461	462	463
Mach No.	.81	.82	.83	.84	.85	.86	.87	.88	.89	.90	.91	.92	.93	.94
α	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10
Δc_p	.019	.019	.0185	.019	.019	.019	.019	.019	.019	.018	.019	.019	.019	.019
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	149	149	149	149.5	149.5	149.5	149.5	149.5	149.5	149.5	150	150	150	150
40	136	135.5	137.5	136.5	135.5	136.5	137	136	137.5	136	137	137	136.5	136.5
50	137	135.5	136.5	135	136	136.5	137	137.5	136.5	136.5	137	137	136.5	137
63	137	136	137.5	137	137	137	137	137	137.5	137.5	137	137.5	137	137
80	137	136	138	137	137.5	137	137	136.5	137.5	137.5	137	137	137	137.5
100	138.5	138.5	138.5	138.5	139	138.5	138.5	138.5	137.5	138.5	138.5	138.5	138.5	138.5
125	138.5	138.5	138.5	138.5	139	139.5	138.5	138.5	139	138.5	139	139.5	139	139
160	139.5	138.5	134	138.5	138.5	138.5	138.5	138.5	139	138.5	138.5	139.5	139	138.5
200	138.5	138	138.5	139	139	138.5	139	138.5	139	138.5	139.5	139.5	139.5	139
250	137	136.5	137	137.5	137	137.5	137.5	137.5	137.5	137.5	138	138.5	138.5	139
320	138	137.5	138	138	136	138	137.5	138	138	138.5	139	139	139	139.5
400	141	141	140	141.5	141.5	141	141.5	141.5	141	141.5	141.5	141	141	141
500	138.5	138	138.5	138.5	138.5	138.5	139	139.5	139	139.5	139.5	140	140.5	140.5
630	135	135	135	135	135.5	135	135	135	135	135	135	136	135	135.5
800	135	133	133.5	134	133.5	133.5	133.5	133	133.5	133.5	133.5	133.5	133.5	134.5
1000	134	134	134.5	134.5	135	134.5	134.5	134.5	134.5	134.5	134.5	135	135	135
1250	132.5	132.5	133	133	133.5	133	133	133.5	133	133.5	133.5	133	133	133
1600	127.5	127.5	128	127.5	127.5	127.5	127.5	127	127.5	127	127.5	127.5	128	128
2000	129	129	130	129.5	129.5	129	129	128.5	128.5	128.5	129	129	129.5	129.5
2500	127.5	127.5	127.5	127.5	127.5	127	127.5	127.5	127.5	127.5	128	128	128.5	129
3200	119	119	119.5	119.5	120	119.5	119	119.5	119.5	119	119.5	119	119.5	119.5
4000	127	127	127	127	127	125.5	126	126	125.5	125	125	125.5	125.5	126

Figure 4.5-29

ACOUSTIC TEST RESULTS - SOLID PRESSURE LEVELS

Transducer Location: 16A

Run No.	113	114	115	116	[illegible]	118	119	120	121	122	123	124	125	126
Mach No.	.8	.8	.8	.8	.8	.8	.8	.85	.85	.85	.85	.85	.85	.85
α	-10	-6	-3	0	+3	+6	+10	-10	-6	-3	0	+3	+ 6	+10
Δe_b	.005	.004	.013	.013	.013	.012	.011	.013	.013	.013	.012	.012	.012	.013

ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR

fc cps / Overall SPL	146.5	146	145.5	145	144.5	144	143.5	143	142.5	142	141.5	141	140.5	140	139.5	139
40	136.5	136.5	135.0	136.0	135.0	134.5	135.5	137.5	136.5	138.0	136.0	136.5	135.5	138		
50	137.0	136.5	134.5	135.5	135.5	135.5	135.5	136.5	135.0	137.5	135.5	136.0	136.0	138.5		
63	136.5	135.0	134.5	135.5	135.0	135.0	135.5	136.0	134.5		135.5	136.0	134.5	138		
80	136.0	135.0	135.0	135.0	135.5	135.0	135.5	136.5	136.0	136.5	135.5	136.5	135.0	138.5		
100	136.0	135.0	134.0	135.0	135.0	135.0	135.0	136.5	135.0	135.5	135.5	135.0	135.0	137.5		
125	135.5	135.0	134.5	135.5	135.0	134.5	135.0	136.5	135.0	135.5	135.5	135.0	135.0	137		
160	134.5	134.5	134.0	134.5	134.0	133.5	134.0	136.0	135.0	135.5	134.5	135.0	134.0	136.5		
200	134.0	134.0	134.0	134.0	133.5	133.5	134.0	135.5	134.5	134.5	134.5	134.0	134.0	136.5		
250	133.0	134.0	132.5	132.0	132.5	132.0	133.0	133.5	133.0	133.0	132.5	133.0	132.5	134		
320	133.5	134.0	134.5	134.5	133.0	132.0	132.0	133.0	132.5	132.5	132.5	132.5	131.5	133.5		
400	139.5	138.5	138.0	135.5	133.5	133.0	132.5	139.0	139.0	138.5	135.5	134.0	132.5	135		
500	[illegible]	[illegible]	137.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
630	[illegible]	[illegible]	139.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
800	[illegible]	[illegible]	138.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
1000	[illegible]	[illegible]	137.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
1250	[illegible]	[illegible]	135.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
1600	[illegible]	[illegible]	135.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
2000	[illegible]	[illegible]	134.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
2500	[illegible]	[illegible]	133.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
3200	[illegible]	[illegible]	132.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
4000	[illegible]	[illegible]	130.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

Figure 4.5-30

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 16A

Run No.	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Mach No.	.9	.9	.9	.9	.9	.9	.9	.95	.95	.95	.95	.95	.95	.95
α	-10	-6	-3	0	+3	+6	+10	-10	-6	-3	0	+3	+6	+10
Δc_p	.017	.016	.014	.014	.013	.013	.013	.017	.015	.015	.015	.014	.013	.013

ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .002 MICROBAR

fc cps / Overall SPL	119	118.5	117.5	117.5	117	117	117	119.5	118.5	118	118	117.5	117	117
40	138	139	138	137.5	138	138	138	139	137.5	138	137.0	137.0	136.0	137.0
50	139.5	139.5	138.5	138	138	138	138	139	138.5	138	138.5	139.0	139.0	137.5
63	138	138.5	138	137.5	138	139	138	138	138	138	137.5	138.0	137.0	136.0
80	139	138	138	138	138	137.5	137	138	138	137.5	137.5	138.0	137.0	137.0
100	138.5	138	137	137	137	136.5	137	138	137.5	137	137.5	137.5	136.5	136.0
125	138	137.5	137	137	137	137	137	138	137	137.5	138.0	136.5	137.0	137.0
160	137	137	136	136.5	136.5	136.5	137	138.5	137.5	137	137.5	137.0	136.5	137.0
200	138	137.5	135.5	137	136.5	136	136	139	137.5	137.5	136.5	137.0	137.0	137.0
250	135.5	135	134	135	135	134.5	135	136.5	135	135	136.0	135.5	136.0	136.0
320	134.5	134.5	134.5	134.5	133.5	134.5	133.5	135	133.5	134	135.0	135.0	134.5	135.0
400	141	141	139	137	135.5	134	134	141.5	141.5	141	139.0	137.5	136.0	134.5
500	135.5	135	133	133	133	132.5	132.5	135.5	135.5	135	134.5	134.5	133.5	133.5
630	133	133	131	130.5	131	130.5	131	134	132.5	132	131.5	131.5	131.0	131.0
800	132.5	131	130.5	130.5	130.5	130.5	131	133.5	132	131	130.5	131.5	130.5	130.5
1000	130	129.5	128.5	128.5	128.5	128.5	129.5	131.5	129	129.5	128.5	128.5	128.0	128.0
1250	127.5	127	126.5	126.5	126.5	126.5	127.5	129.5	127	127.5	126.5	127.5	127.5	127.5
1600	126.5	126.5	125.5	125.5	125.5	125.5	126.5	128.5	126.5	126.5	125.5	126.5	126.5	126.5
2000	125.5	125.5	124.5	124.5	124.5	124.5	125.5	127.5	125.5	125.5	124.5	125.5	125.5	125.5
2500	124	124.5	123.5	123.5	123.5	123.5	124.5	126.5	124.5	124.5	123.5	124.5	124.5	124.5
3200	123	123.5	122.5	122.5	122.5	122.5	123.5	125.5	123.5	123.5	122.5	123.5	123.5	123.5
4000	122	122.5	121.5	121.5	121.5	121.5	122.5	124.5	122.5	122.5	121.5	122.5	122.5	122.5

Figure 4.5-31

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 16B

Run No.	196	200	201	202	206	207	208	209	164					
Mach No.	1.1	1.0	1.0	.95	.9	.2	.85	.85	.95					
α	+18	0	+18	+18	0	+18	+18	0	+10					
Δc_p	.011	.012	.018	.015	.016	.02	.02	.015	.018					
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	146.5	147	150.5	148	148.5	150.5	150	147.5	150					
40	135.0	133.0	138.0	132.5	137	136	137.5	134	135					
50	134.5	134.5	139.0	134.0	137	137.5	137	136	136					
63	134.5	136.0	138.5	134.0	137	137	137	135	137					
80	135.0	136.5	139.0	134.5	137.5	137	137.5	138	137					
100	134.5	137.0	138.5	134.5	138	137	138	138	138.5					
125	134.5	137.0	139.0	135.5	139	137	138.5	138	139.5					
160	134.5	138.0	139.0	136.5	138.5	139	139	138	139.5					
200	135.5	138.0	140.0	137.5	138.5	139.5	139.5	138	140					
250	135.0	136.5	139.5	136.5	138	139	138	137	138.5					
320	135.0	136.0	139.5	137.5	137.5	139.5	138	137.5	139					
400	135.5	136.0	140.0	138.5	137.5	140.5	140	137.5	141					
500	135.5	134.5	140.5	140.0	135.5	144.5	142.5	135.5	142.5					
630	135.5		136.5	136.5		138	135.5		136					
800	136.5		136.0	135.0		137	134.5		134					
1000			135.5	133.5		135.5	134		135.5					
1250														
1600														
2000														
2500														
3200														
4000														

Figure 4.5-32

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 16B

Run No.	210	211	212	213	214	215	216	217	218	219	220	221	222	449
Mach No.	.85	.8	.8	.8	.7	.7	.7	.6	.6	.6	.5	.5	.5	.80
α	-10	-10	0	+18	+18	0	-10	-10	0	+18	+18	0	-10	+10
Δc_p	.0085	.01	.015	.021	.022	.018	.015	.012	.016	.018	.016	.015	.012	.017
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	142.5	143	147	150	148	146	144.5	141	143.5	144.5	141	140.5	138.5	148
40	130	129.5	133	136	133	132	128	126	128	129.5	127	127	125	135.5
50	131.5	131	134	137.5	134	132	128	128	129.5	130	128	127	125	136.5
63	131.5	132	135	137	133.5	133	129.5	128	130	131.5	128	128	125.5	138
80	132	132.5	136	138	135	133	131	129	131	132	129	129	127	138.5
100	132.5	132	136	137.5	134.5	133	130	129	130.5	132	128.5	128.5	127.5	137.5
125	132.5	132.5	136	137.5	135	133	130	129.5	131.5	132.5	129	129	128	138
160	133	132	137	138	135.5	134	131	130	132	132	129	131.5	129	137.5
200	133.5	133.5	138	138	136	136	133.5	132.5	135	133	131	135.5	132	137.5
250	133	133.5	137	137.5	135	137	132.5	131.5	135	134	133	132	129	136.5
320	133.5	134	136.5	137.5	136	136.5	139	131.5	134.5	136	134	128.5	127.5	137.5
400	134	134	137.5	141	142	137	134	131	132	138	129.5	127.5	128	139.5
500	133.5	133	134.5	144	140.5	134	132.5	130	131	133	128	127.5	126.5	136
630	130.5	130	131.5	135	133	130.5	130	128	128	130.5	127.5	125	124.5	132.5
800	130	130	131	134.5	132.5	130	129.5	126.5	127.5	129.5	125.5	124.5	123.5	132.5
1000	129	130	130.5	134	131.5	129	129.5	126.5	125.5	128	124	122	122	130.5
1250	125	126.5	124.5	130.5	126.5	126	126.5	122.5	122	123	119.5	118	118	126.5
1600	117.5	117.5	117.5	122	121	118.5	117.5	115.5	115	118	114	111.5	111	119.5
2000	123.5	123.5	123.5	129.5	128.5	124	124	123.5	123.5	125.5	122.5	120	120	124.5
2500	124	124	123.5	130	127.5	124	123.5	123.5	123	125.5	122.5	120.5	120.5	123.5
3200	124.5	124.5	124	131.5	129.5	124	124	123.5	123.5	128.5	125.5	122.5	122	122.5
4000	122	122.5	122	127	125	124	122	121.5	121	123.5	121	118.5	119	124.5

Figure 4.5-33

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 16B

Run No.	450	451	452	453	454	455	456	457	458	459	460	461	462	463
Mach No.	.81	.82	.83	.84	.85	.86	.87	.88	.89	.9	.91	.92	16	16
α	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	+10	.93	.94
Δc_p	.018	.018	.018	.018	.017	.018	.018	.018	.017	.017	.017	.018	.018	.018
fc cps / Overall SPL	ONE THIRD OCTAVE BAND SOUND PRESSURE LEVELS - DB RE: .0002 MICROBAR													
	148.5	148.5	149	148.5	149	149.5	149	149	148.5	149	149	149.5	149.5	149
40	135.5	135.5	137	136.5	135	136.5	136.5	136.5	137	136	137	137	136	136.5
50	137	136	137	136.5	136.5	137.5	137	138.5	137	137	138	137	137.5	137.5
63	137.5	136.5	138.5	137.5	137.5	137.5	138.5	137.5	138	138.5	138	137.5	137	137.5
80	138	137.5	139.5	138	138.5	137.5	138	138.5	138	138.5	138	137.5	138	137.5
100	138.5	138.5	138.5	138.5	139	138.5	138	138.5	137.5	139	138.5	138.5	138	138.5
125	137	139	138.5	138.5	139	139	138	138	138.5	138.5	139	138.5	138.5	138
160	138.5	137.5	138.5	138	138.5	138.5	138.5	138.5	138.5	138.5	138.5	138.5	138.5	138
200	138.5	138.5	139	139.5	139	139	139	138.5	139.5	139	139.5	139.5	139.5	138.5
250	137.5	137.5	138	138	138.5	138.5	138.5	138	138.5	138.5	138.5	139.5	138.5	139.5
320	138	138	138	138	138.5	138	137.5	138	138	138.5	138.5	138.5	138.5	139
400	139.5	140	139.5	140	140.5	140	140	140	139.5	140.5	139.5	139.5	139.5	139.5
500	136.5	136.5	136.5	136.5	137	137	137	137.5	137	137	137.5	138	137.5	138
630	133	133	133	133	133.5	133.5	133.5	133	133.5	133.5	133	134	133	133.5
800	132.5	132.5	133	133.5	133.5	133	133.5	133	133	133	133.5	133.5	133	133.5
1000	131	131.5	132	132	132	132	132	132	131.5	132	132	132	132	132
1250	126	126	126.5	126.5	127	126.5	126.5	126	126	126	126	126	126	126
1600	120	120	120	120.5	120.5	120.5	120.5	120.5	120	120.5	120.5	121	120.5	121
2000	124.5	125	125	125	125	124.5	124.5	124.5	124	124	124.5	125	124.5	125
2500	123.5	124	124	124	124.5	123.5	123.5	123.5	123	123	123	123.5	123.5	124
3200	122.5	123	123	123	123	122.5	122.5	122.5	122	122	121.5	121.5	122	123.5
4000	125	125.5	125.5	125.5	126	125.5	125	125.5	125	124.5	124	124	124.5	125.5

Figure 4.5-34

ACOUSTIC TEST RESULTS - SOUND PRESSURE LEVELS

Transducer Location: 17

Run No.	197	201	206	207	208	209	212	213	215
Mach No.	1.1	1.0	.9	.9	.85	.85	.8	.8	.7
α	0	+18	0	+18	+18	0	0	+18	0°
Δc_p	.044	.021	.016	.017	.019	.010	.022	.02	.02
fc cps / Overall SPL	158.5	152	148.5	149	149.5	149	150	149.5	147
40	138.0	142.0	137.0	139.0	138	136.5	134.5	137.5	
50	139.5	143.0	138.5	139.0	138.5	138.0	135.5	138.0	
63	141.0	143.0	138.5	139.5	140.0	138.5	136.5	139.0	
80	142.0	143.5	139.5	140.0	139.5	139.0	137.5	140.0	
100	142.0	142.5	139.5	140.0	140.5	140.0	138.8	141.5	
125	143.5	143.0	140.0	140.0	141.5	140.5	139.5	141.5	137
160	144.5	143.0	140.5	140.5	141.5	141.0	140.0	141.5	138.5
200	146.0	143.0	141.5	142.5	142.0	142.0	142.0	142.0	141
250	147.0						141.0		140
320	147.0						140.5		138
400	147.0						141.0		138.5
500	147.5								136.5
630	148.0								
800	147.5								
1000	146.5								
1250	146.0								
1600	150.5								
2000	144.5								
2500	143.5								
3200									
4000									

Figure 4.5-35

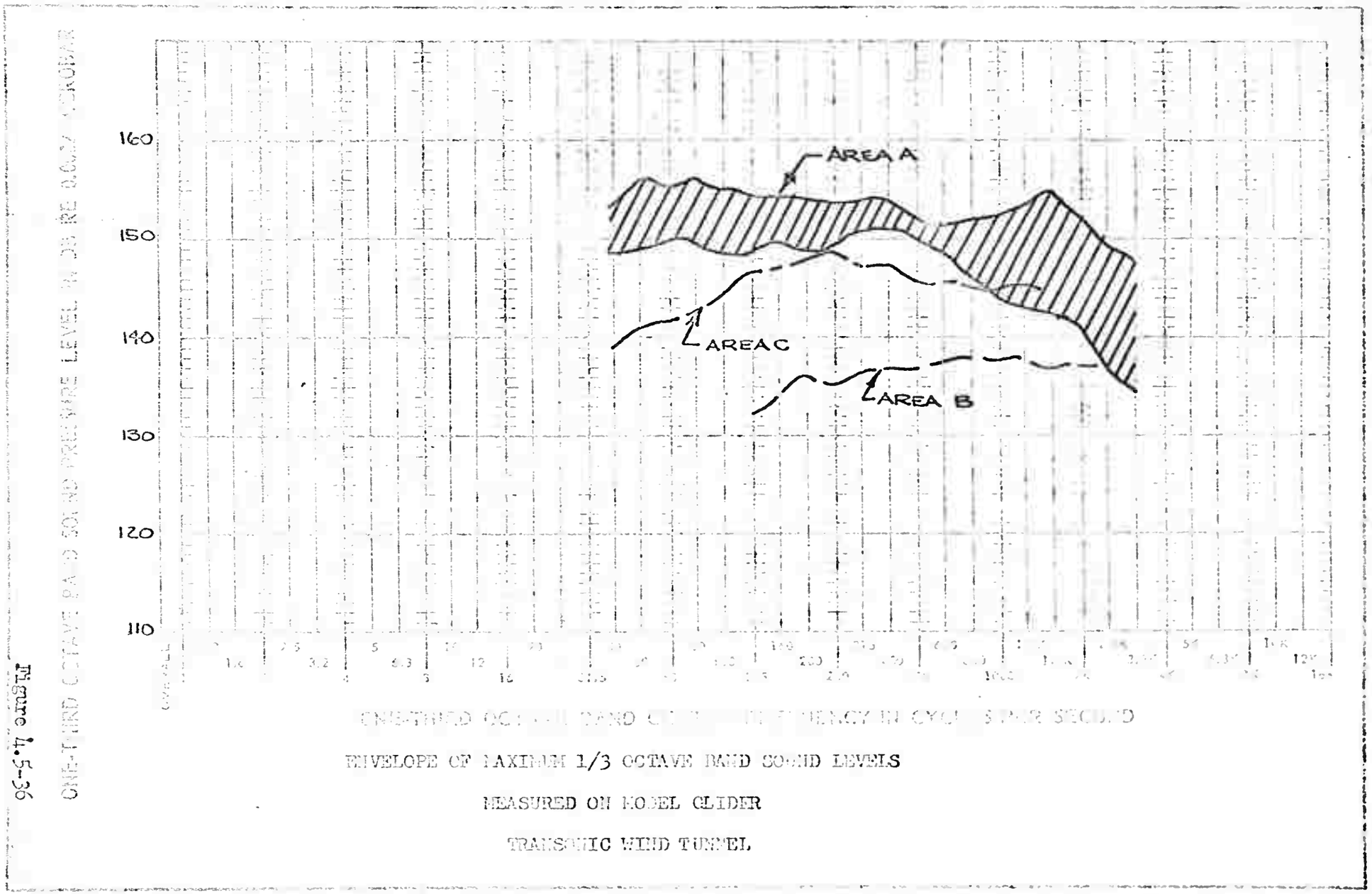


Figure 4.5-36

ENVELOPE OF MAXIMUM 1/3 OCTAVE BAND SOUND LEVELS

MEASURED ON MODEL GLIDER

TRANSONIC WIND TUNNEL

D2-80713

ENVELOPE OF MAXIMUM 1/3 OCTAVE BAND SOUND LEVELS

MEASURED ON MODEL GLIDER

TRANSONIC WIND TUNNEL

Figure 4.5-37

AREA	TEST POINT(S)	AREA DESCRIPTION
A	1-3	CANOPY TOP - FRONT
B	4-5	CANOPY TOP - AFT
C	6-7	CANOPY SIDE
D	9-11	WING - TOP
E	12	WING - BOTTOM
F	15B, 15C AND 17	SECONDARY POWER BAY
G	15A AND 16A	A.R.M PRESSURE BAFFLE

▷ USE IN CONJUNCTION WITH FIGURES 4S-36 AND 4S-37 OF D2-80713

CALC			REVISED	DATE	MODEL GLIDER AREA IDENTIFICATION ▷	FIG. 4.5-37
CHECK						D2-80713-1
APR						
APR					THE BOEING COMPANY	PAGE 104a

U3 4036 8000

Figure 4.5-30

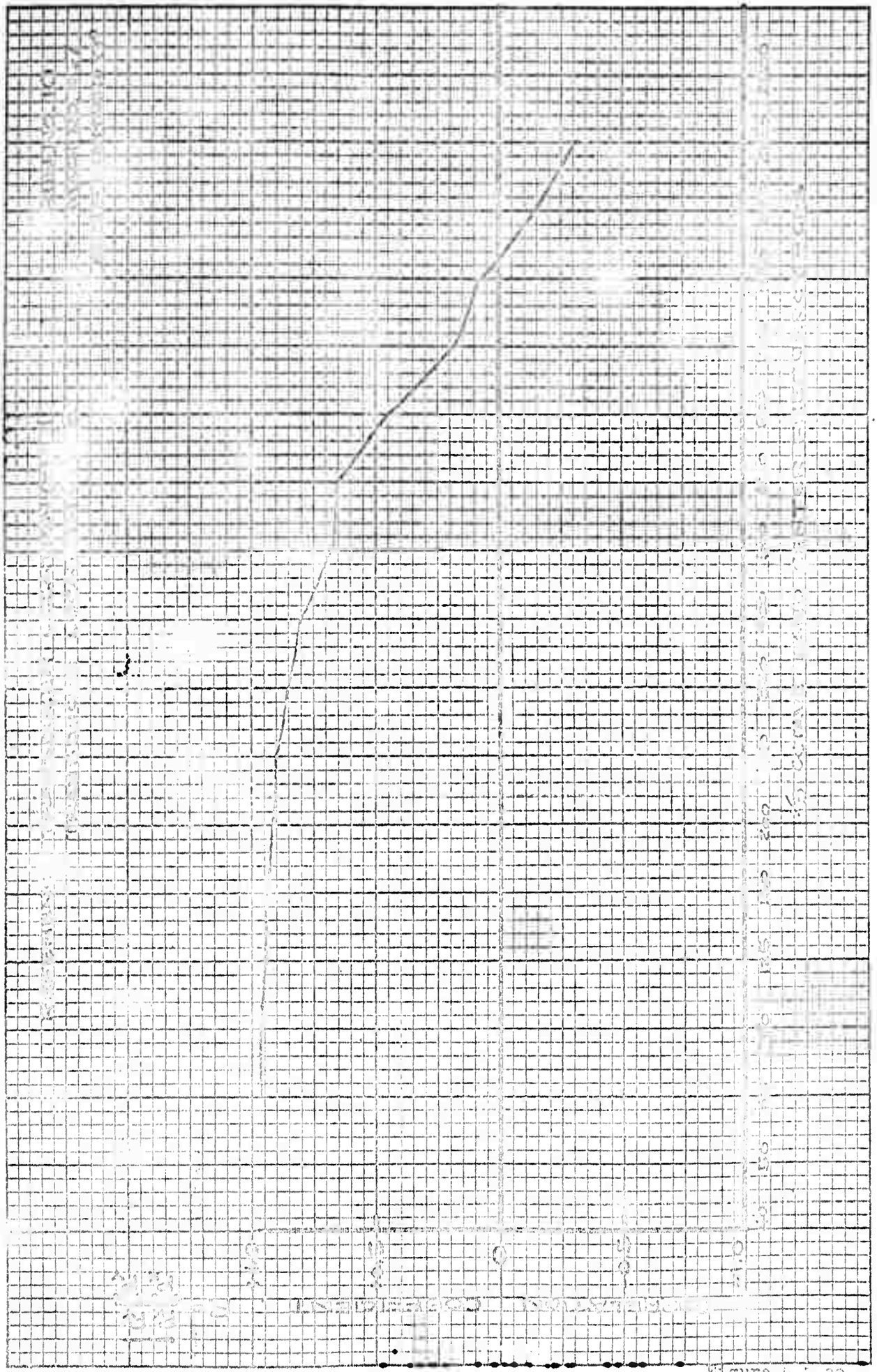


Figure 4.5-39

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Figure 4.5-40
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NO. 313. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

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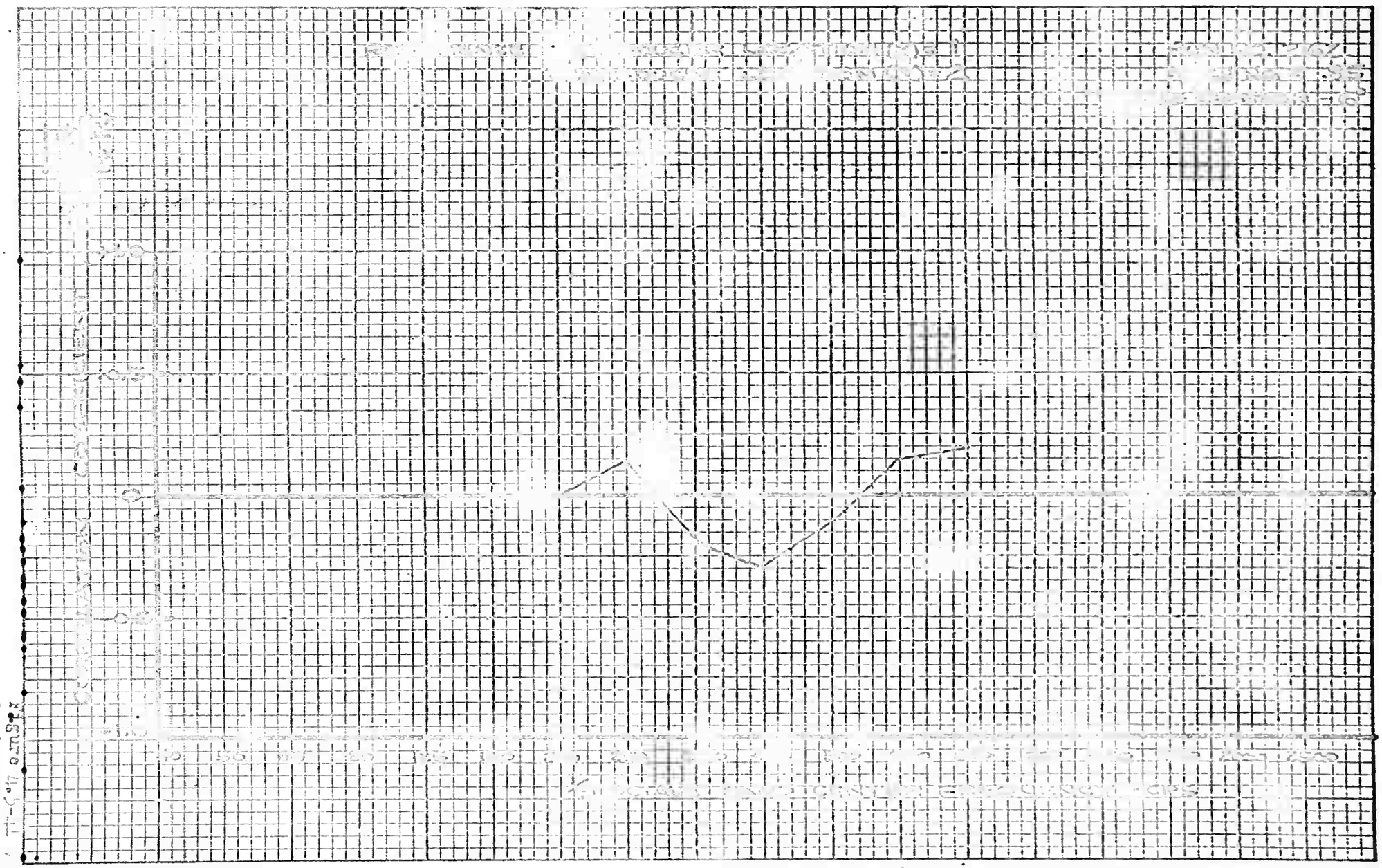
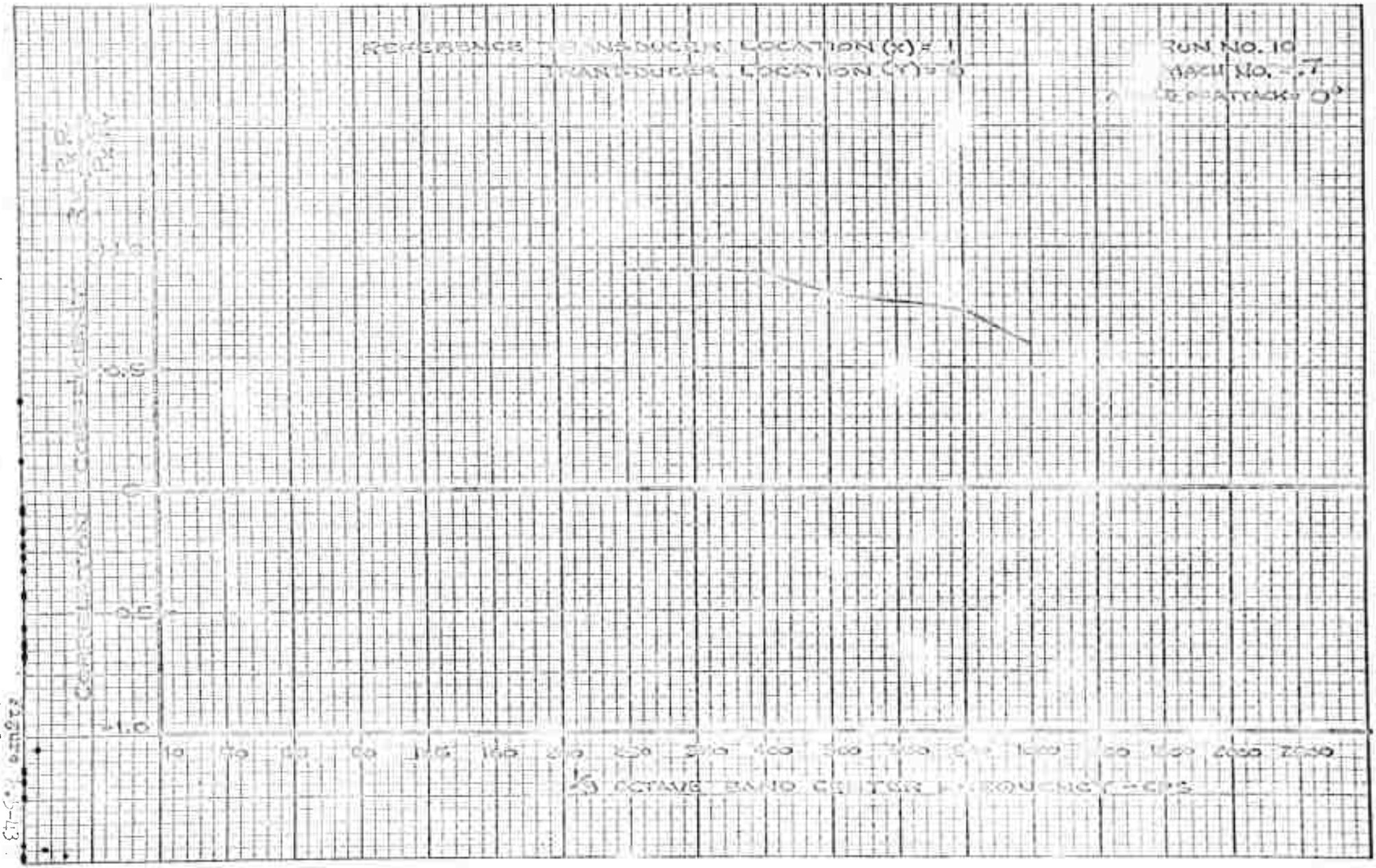


Figure 4

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Figure 4.5-42.



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Page 110

D2-80713
Page 111

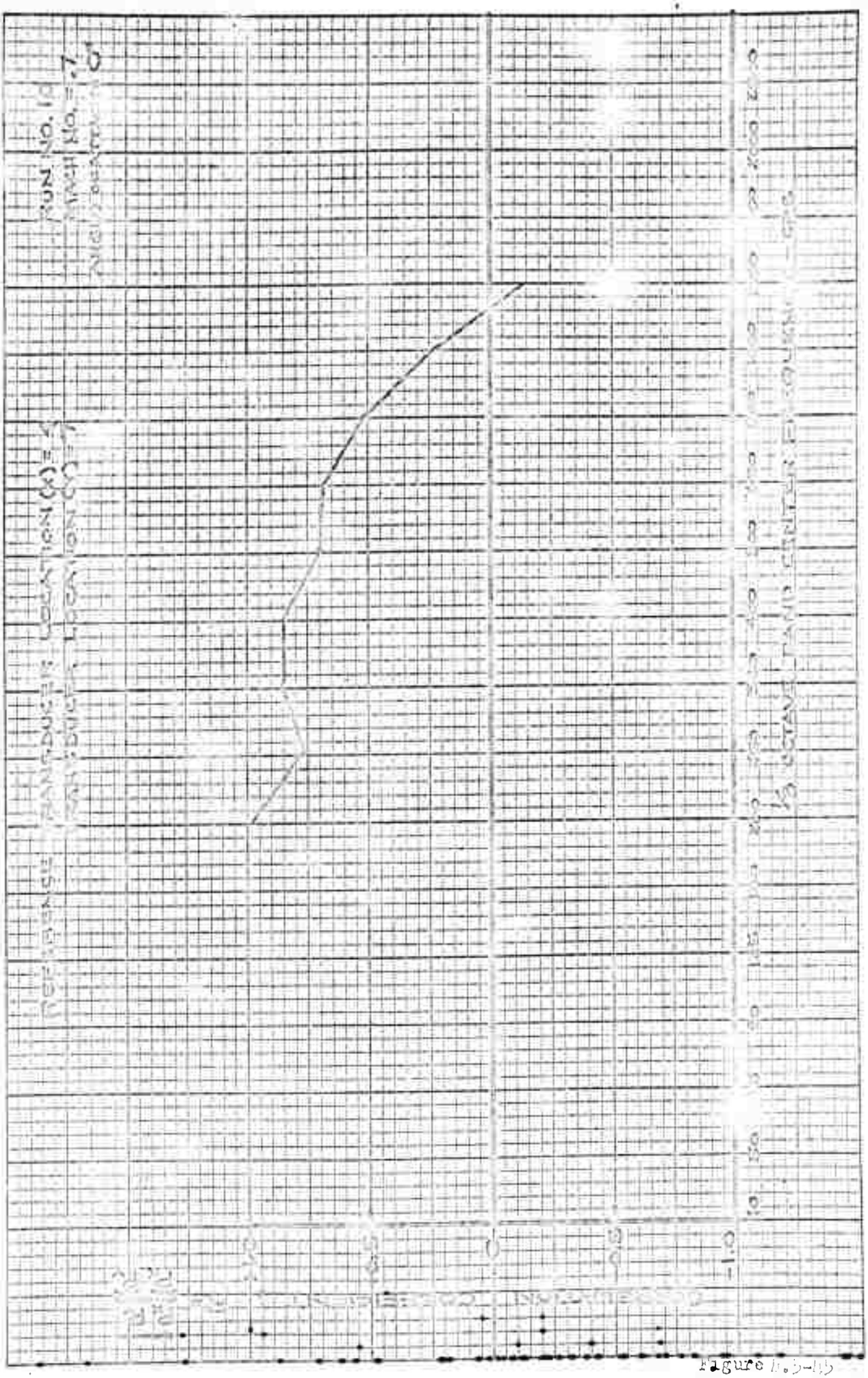


Figure B-4b
D2-86713
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NO 315. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

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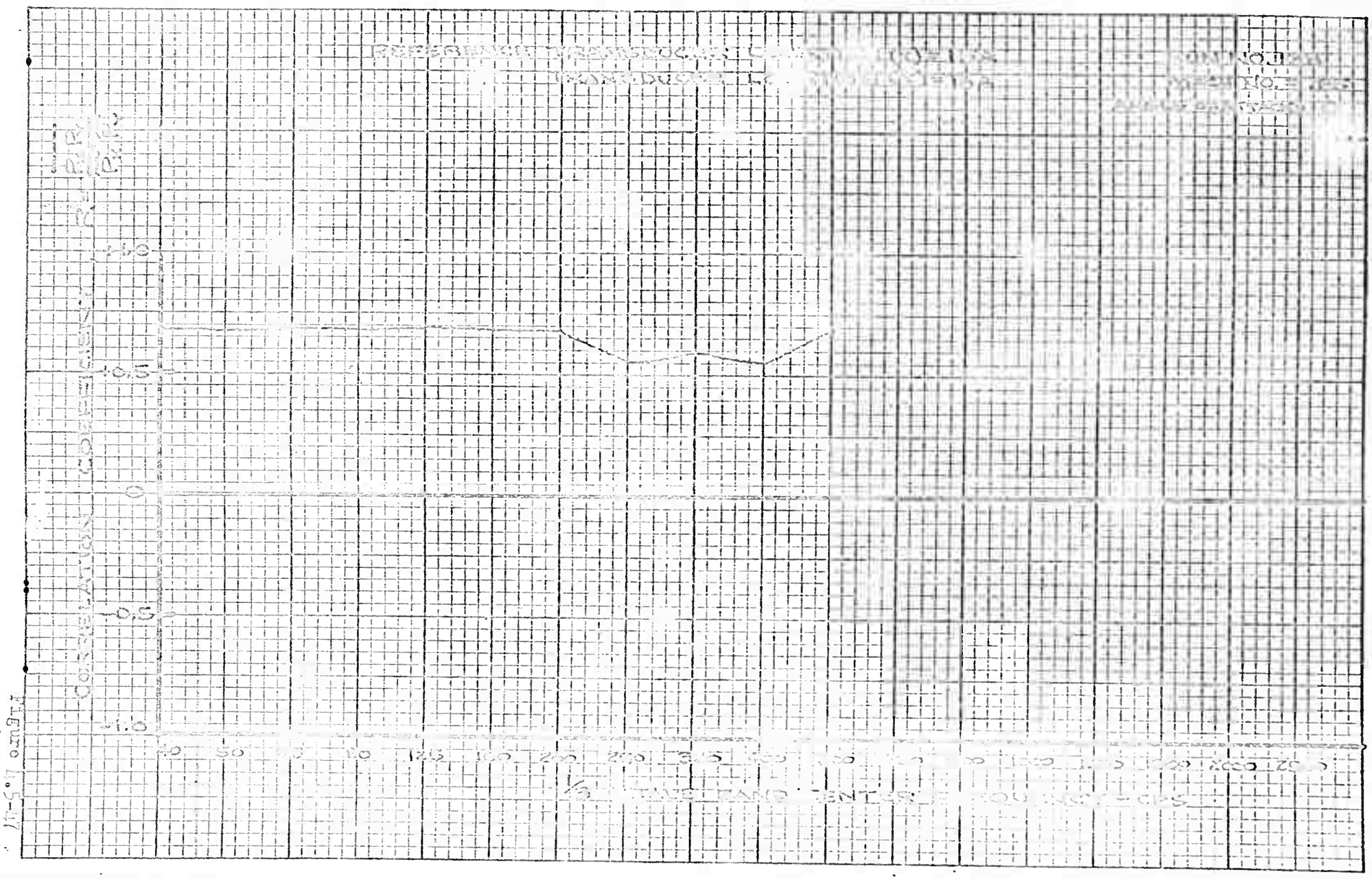


Figure D2-80713
Page 114

NO. 313. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

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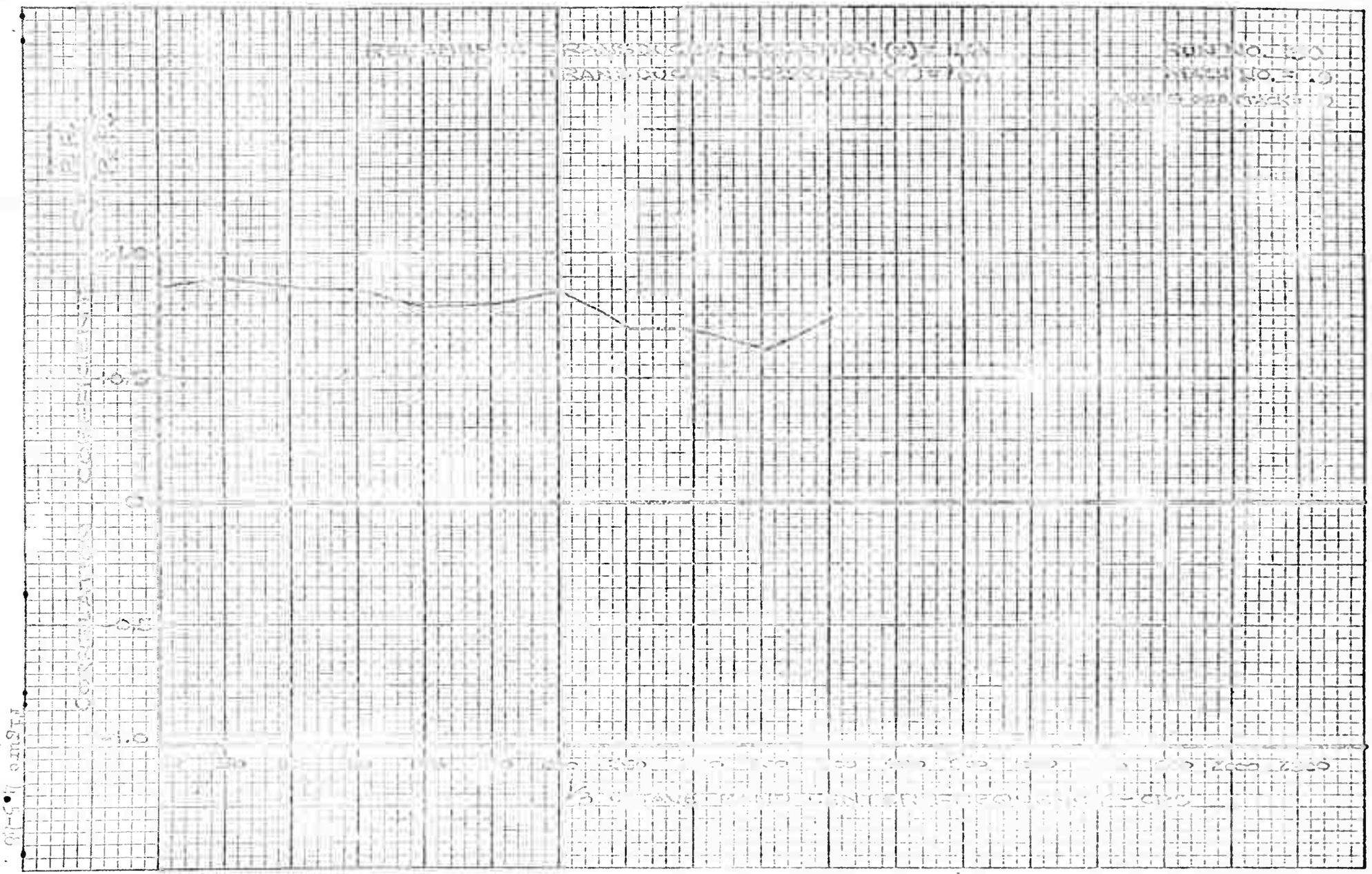
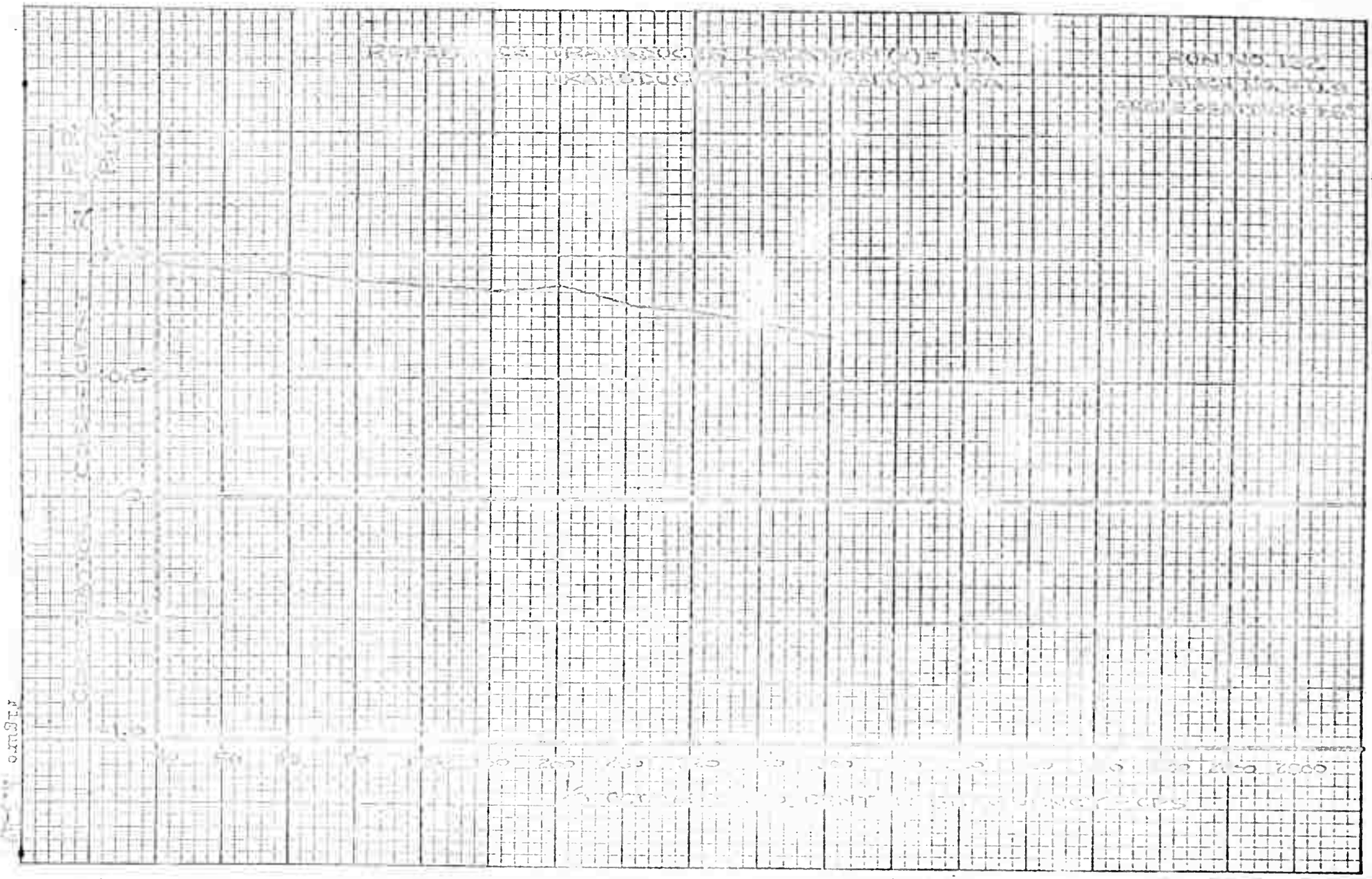
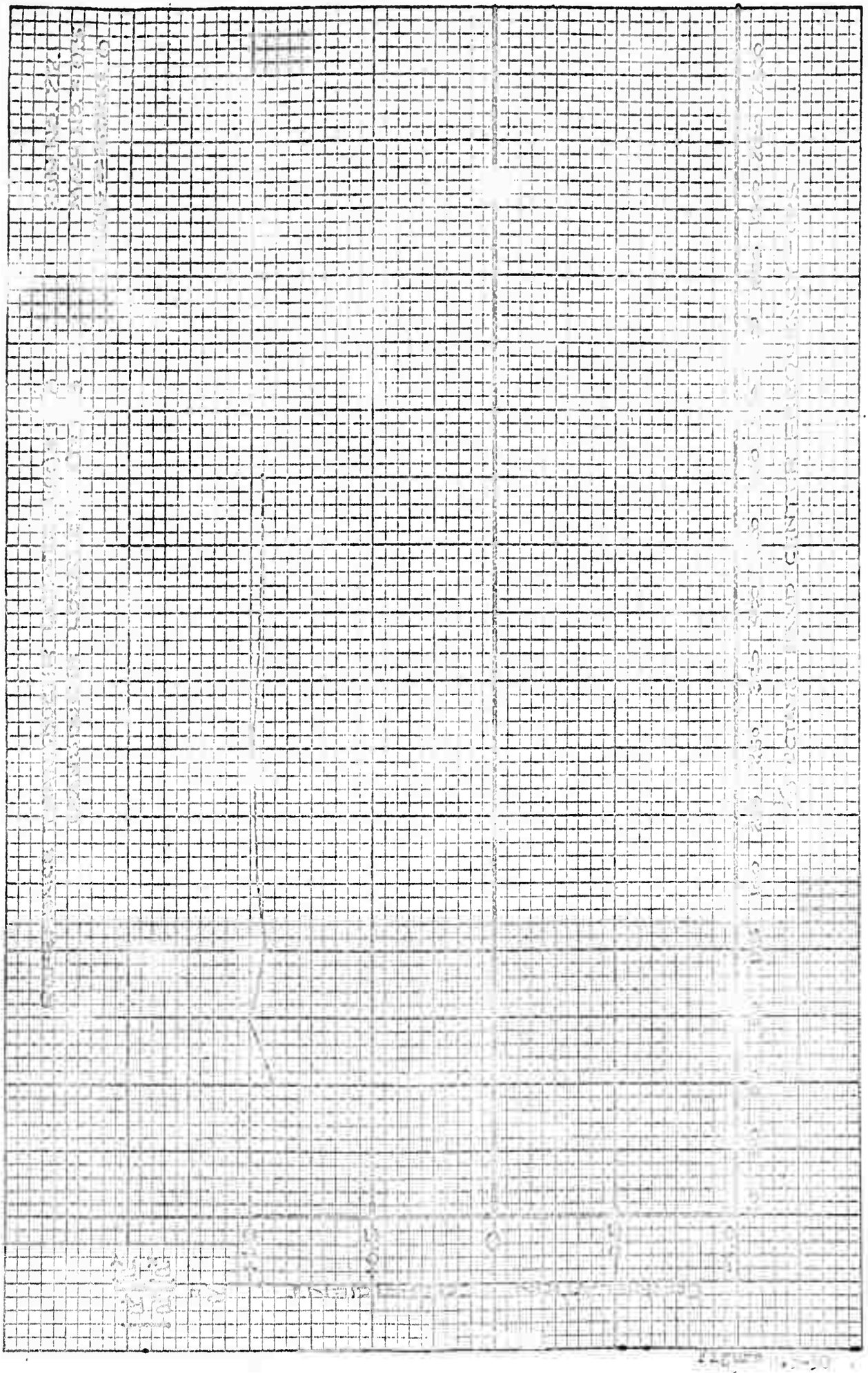


Figure D2-10
D2-80713
Page 115

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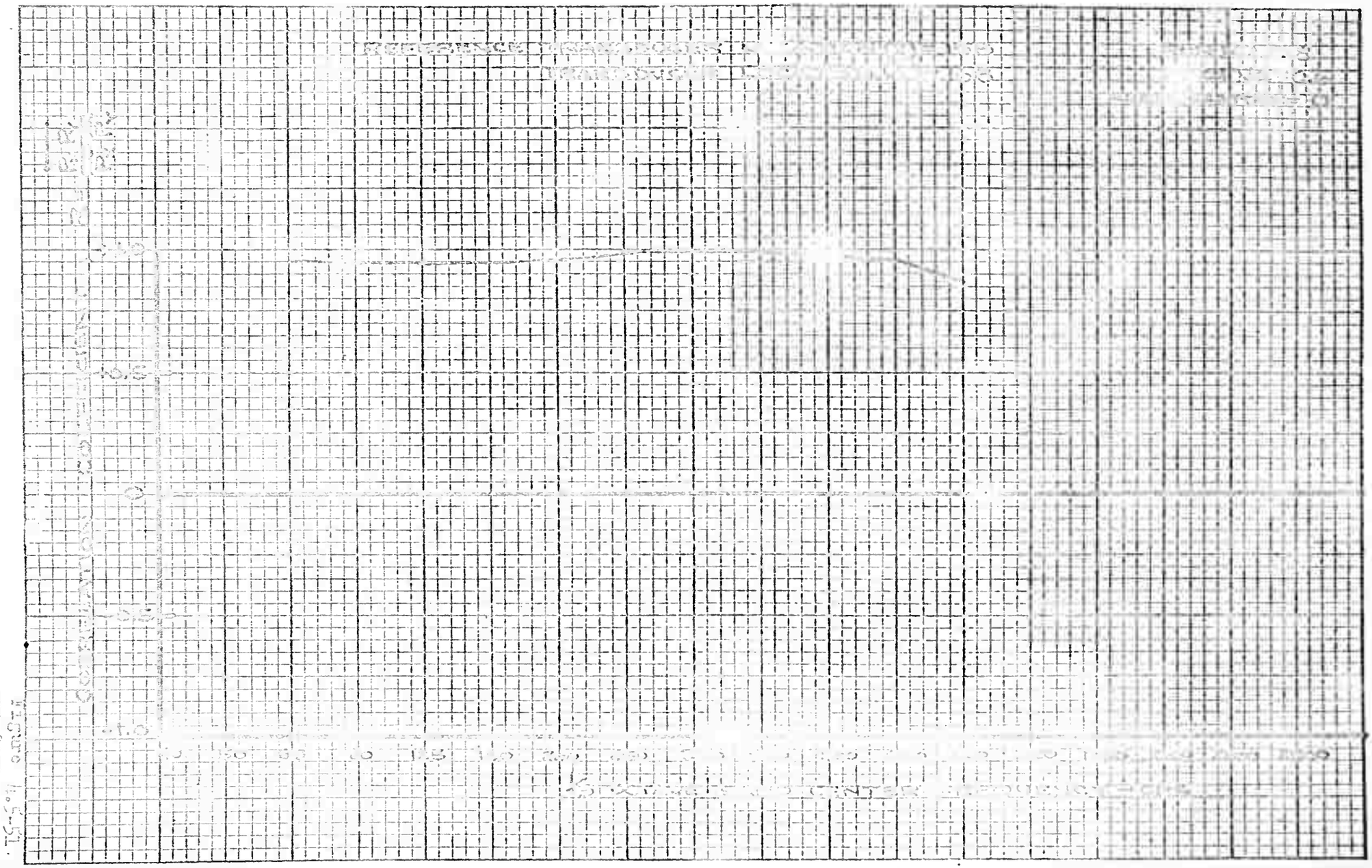


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NO. 315. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

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72-80715
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NO. 315. 10 DIVISIONS PER INCH BOTH WAYS. 70 & 100 DIVISIONS.
CORRELATION COEFFICIENT
0.5
0
-0.5
2000
1500
1000
500
250
100
50
25
10
5
2
1
0.5
0.2
0.1

Figure 4.5-52.

NO. 315. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

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Figure B.5-53

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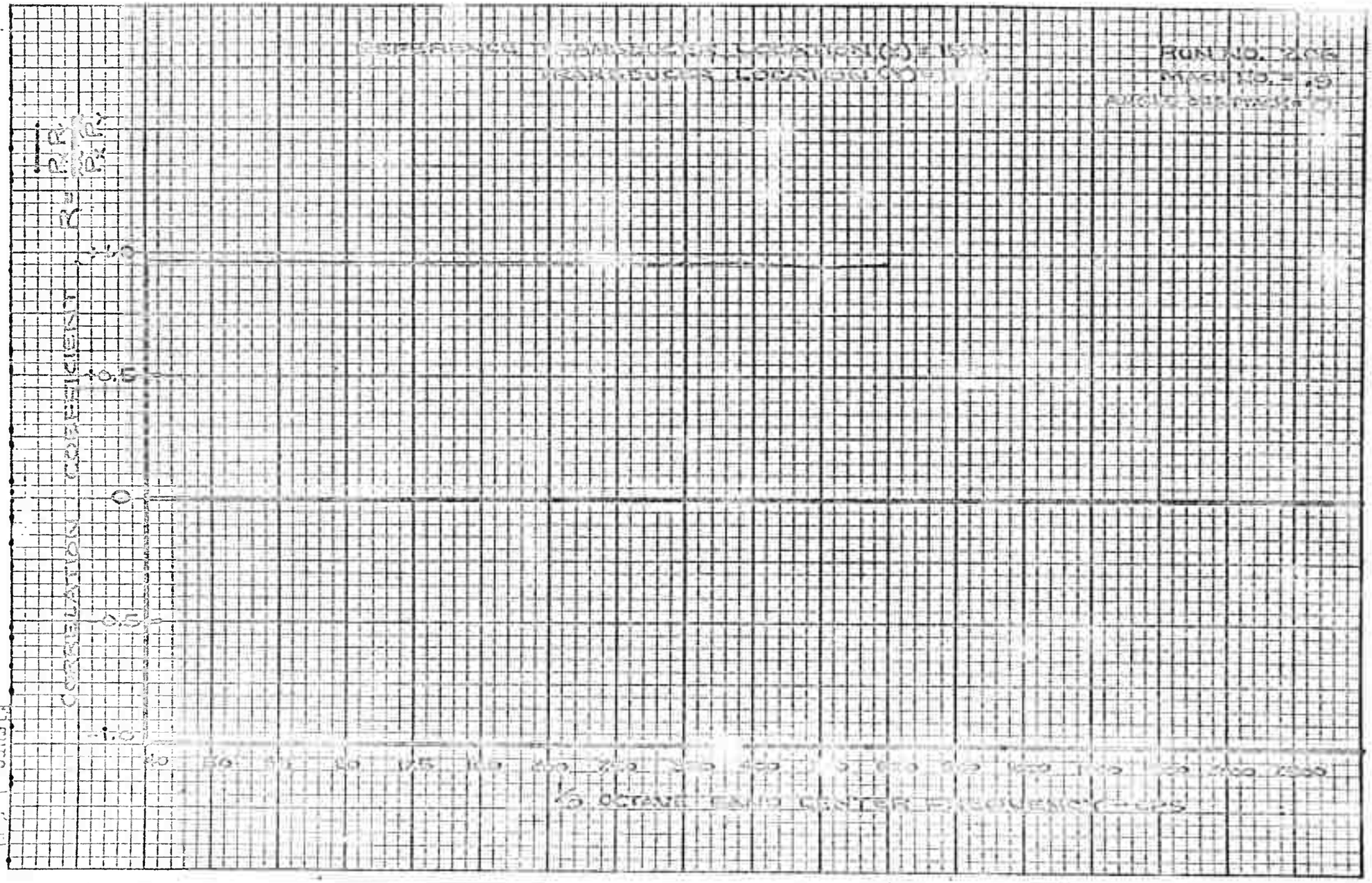
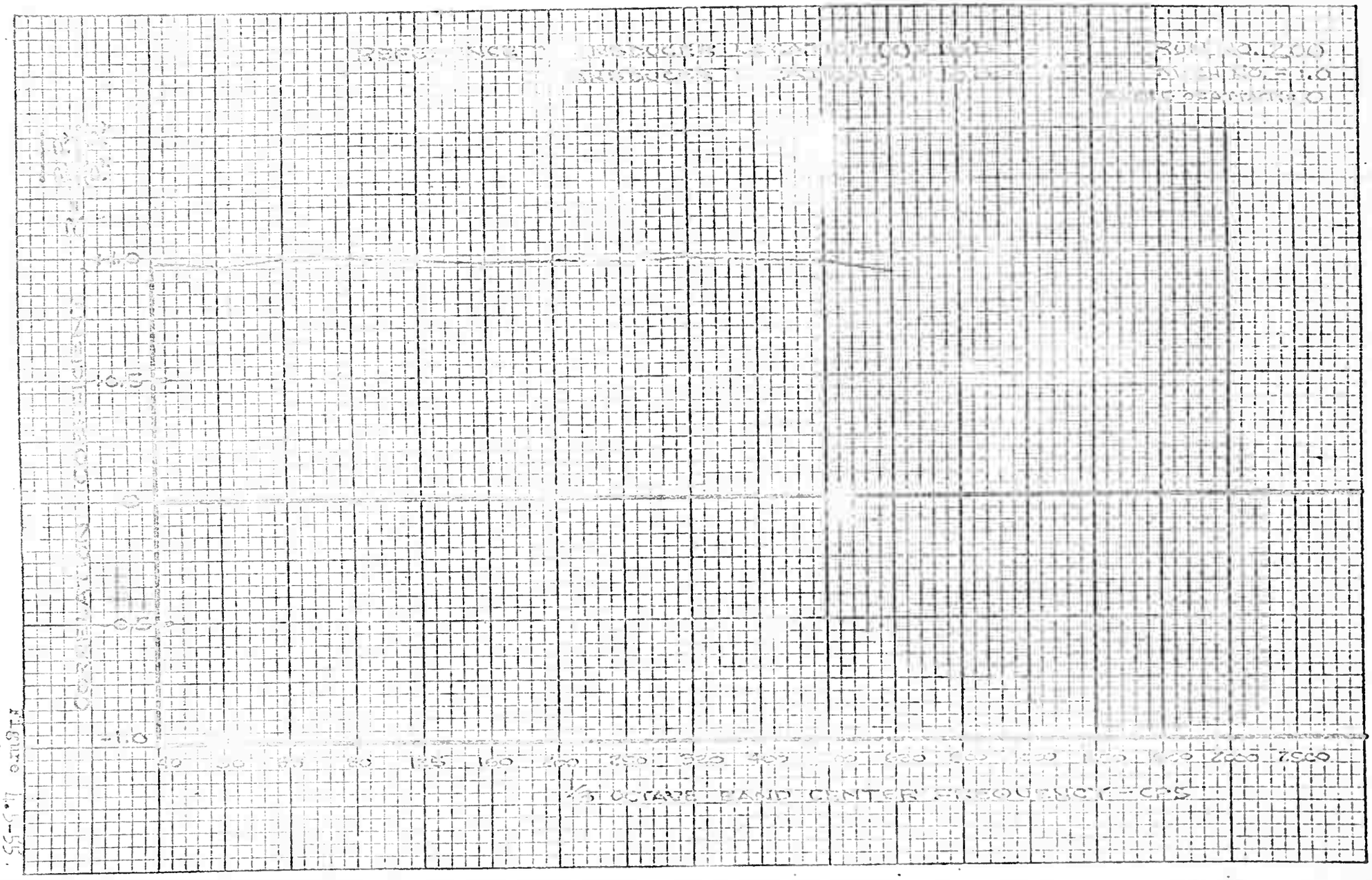


Figure 4.5-24.
D2-80713
Page 121

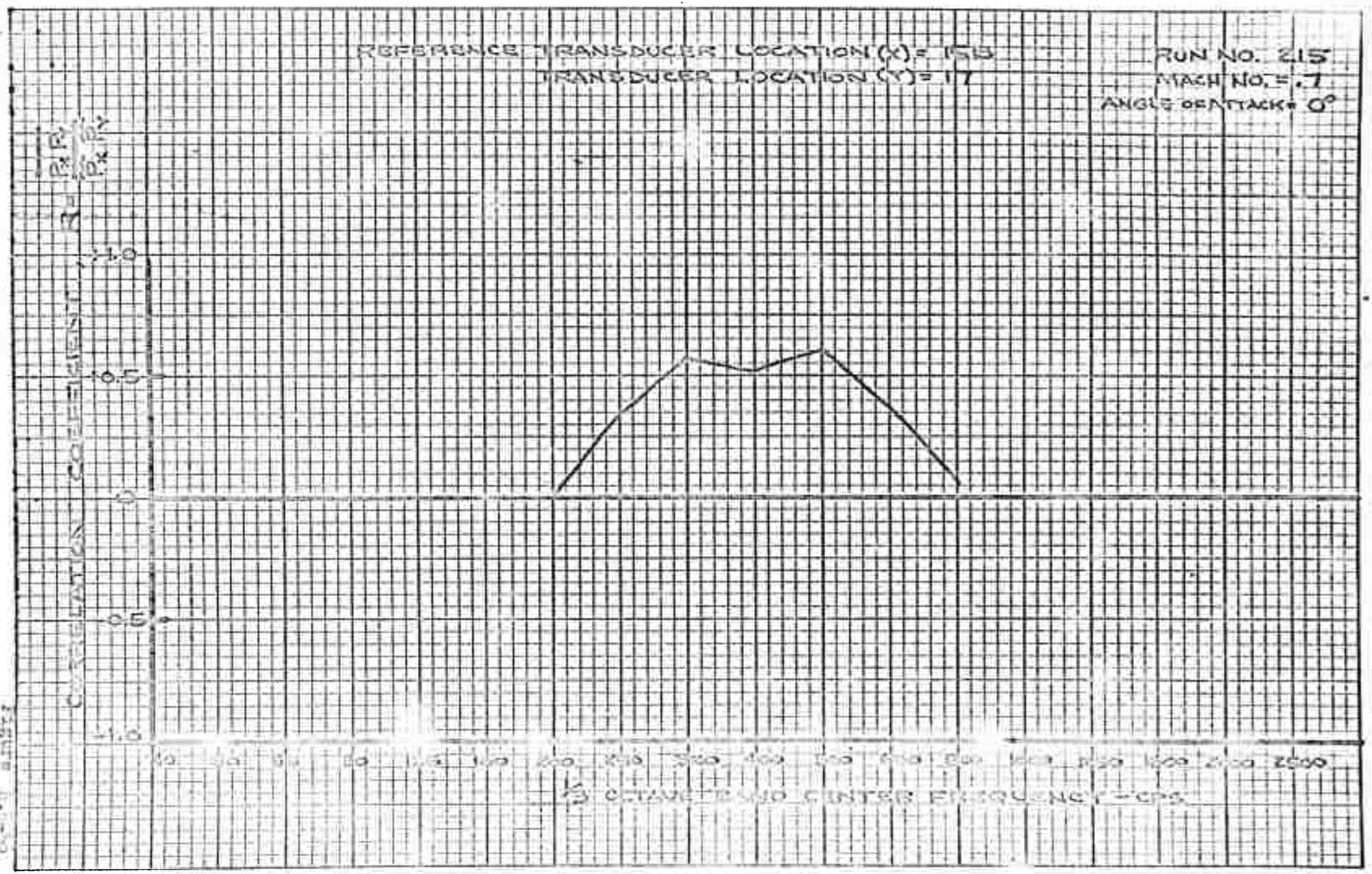
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D2-80712
Page 122

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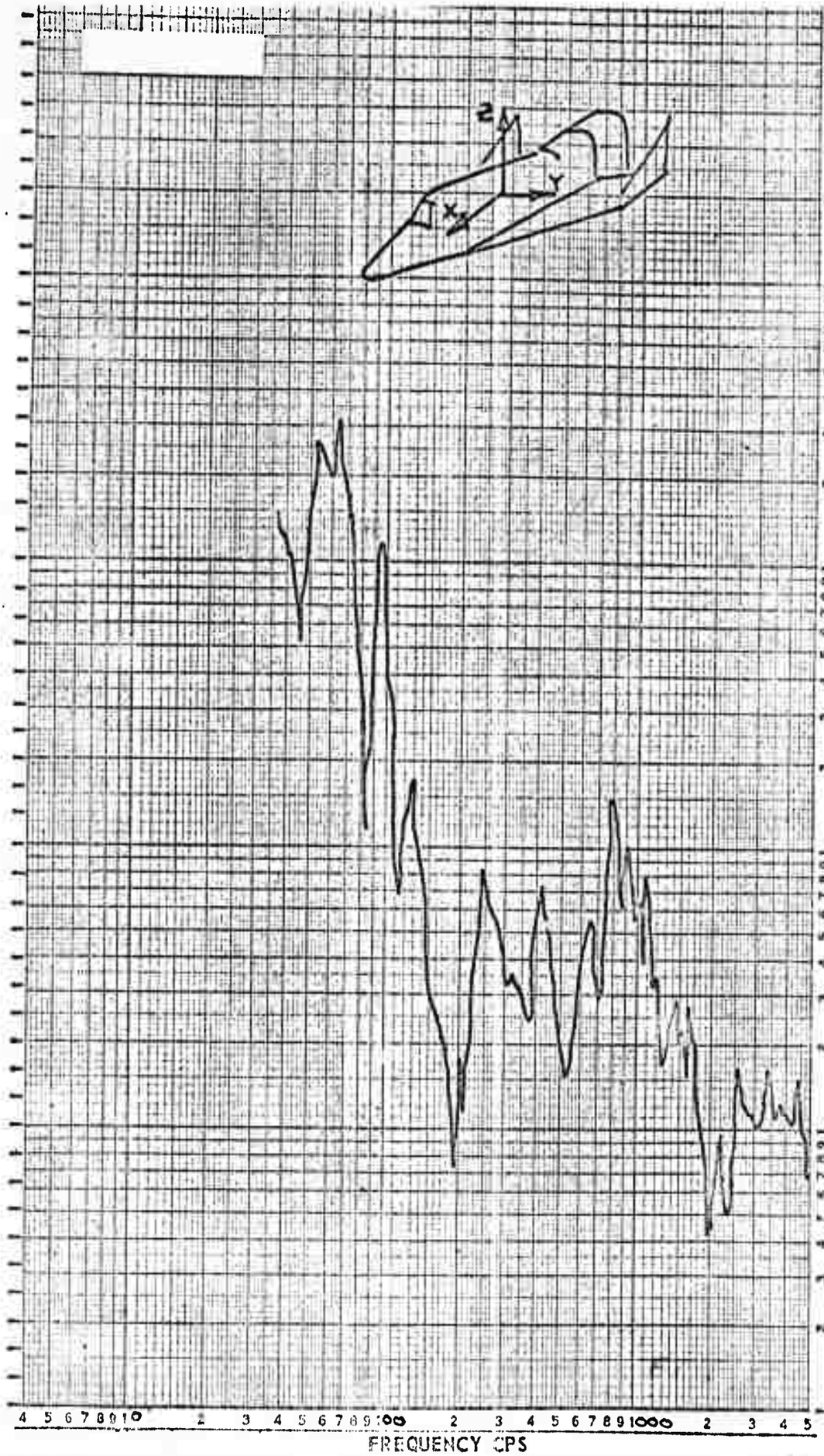
B2-80713
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Figure 4.5-57.

Figure 4.5-58

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Page 125

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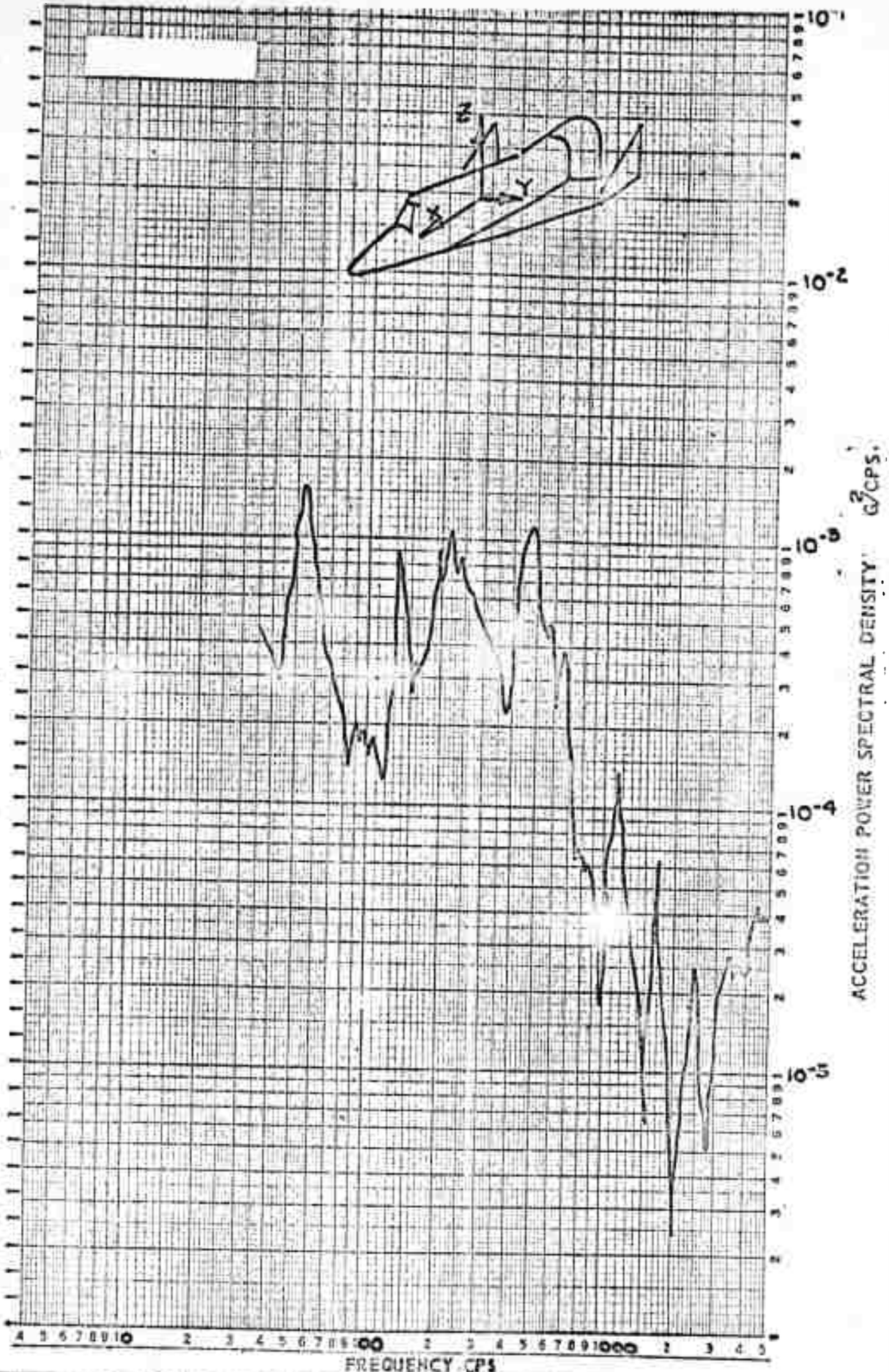


CONDITION NC

TEST NO.

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - X AXIS (M = .5-.7 All δe, δr)
CHECK					
APPR					
APPR					
					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON

FIGURE 4.5-52
D2-80713
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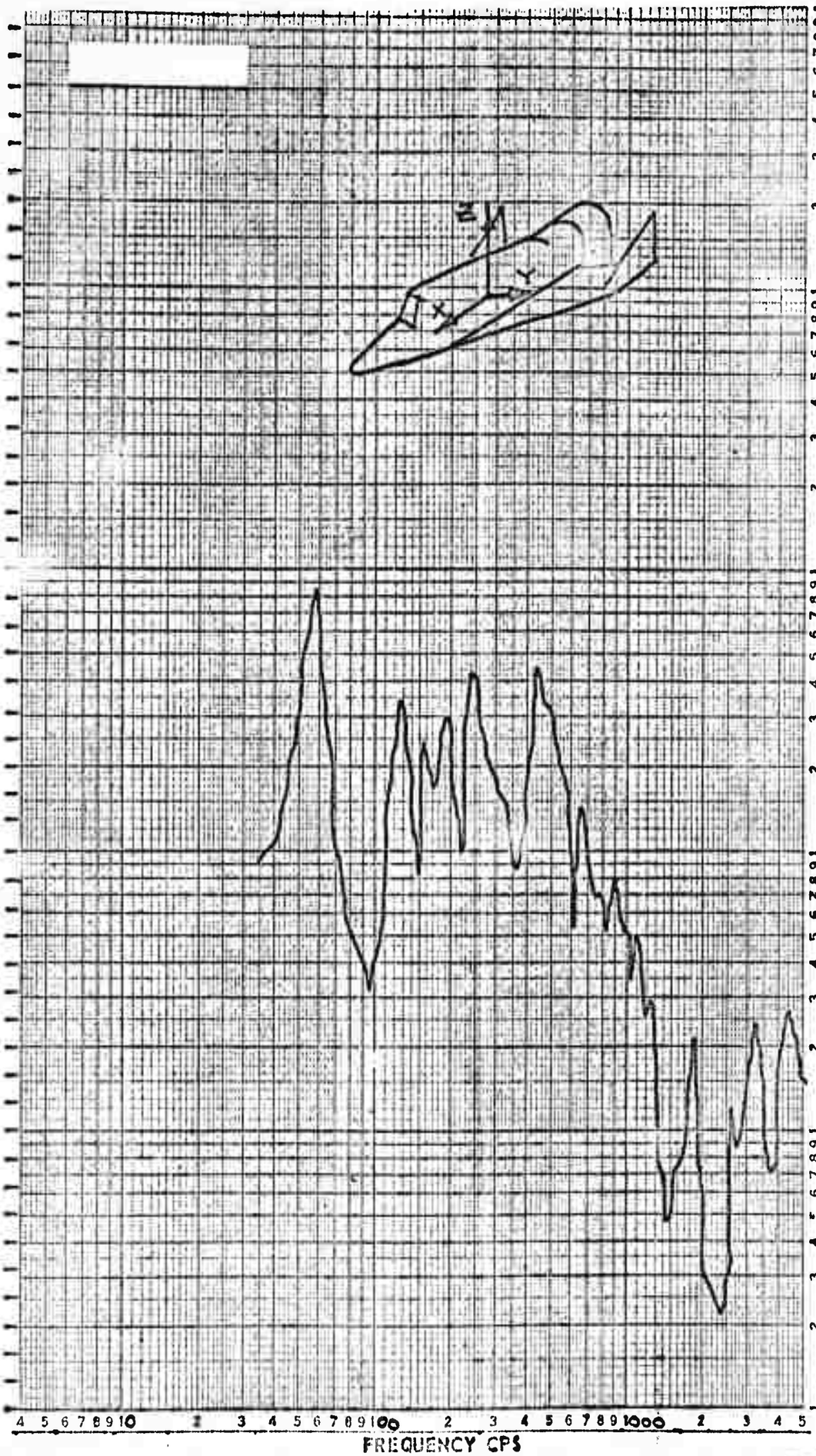


TEST NO.

CONDITION NC

			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - X AXIS (M = .3-1.1 δe, δr ≠ 0)	FIGURE 1.5-69
CALC						
CHECK						D2-30713
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 127
APPR						

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CONDITION NC

TEST NO.

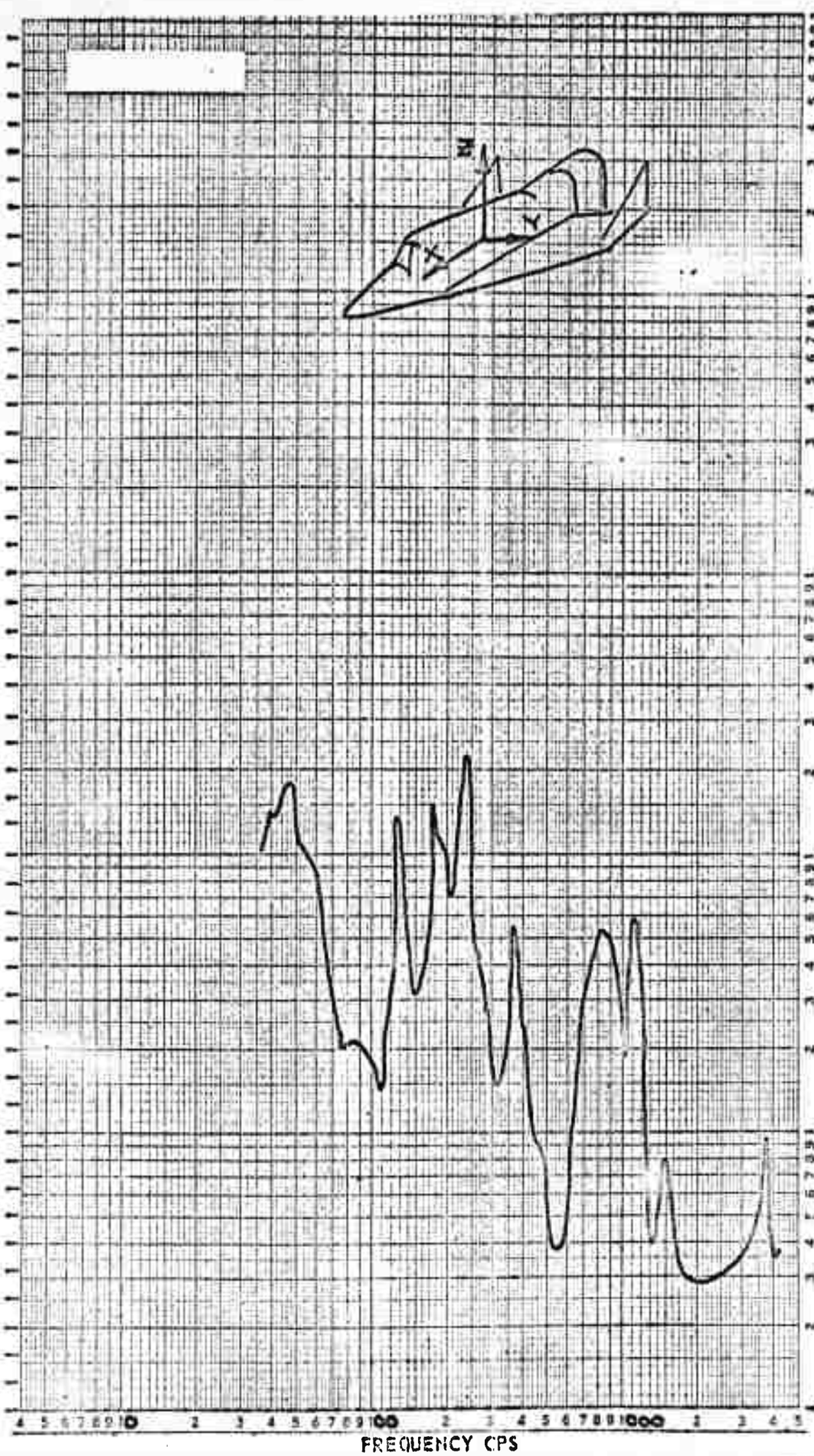
CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA * X AXIS (M = .8-1.1 δe = δr = 0)
CHECK					
APPR					
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON

FIGURE 4.5-61

D2-80713

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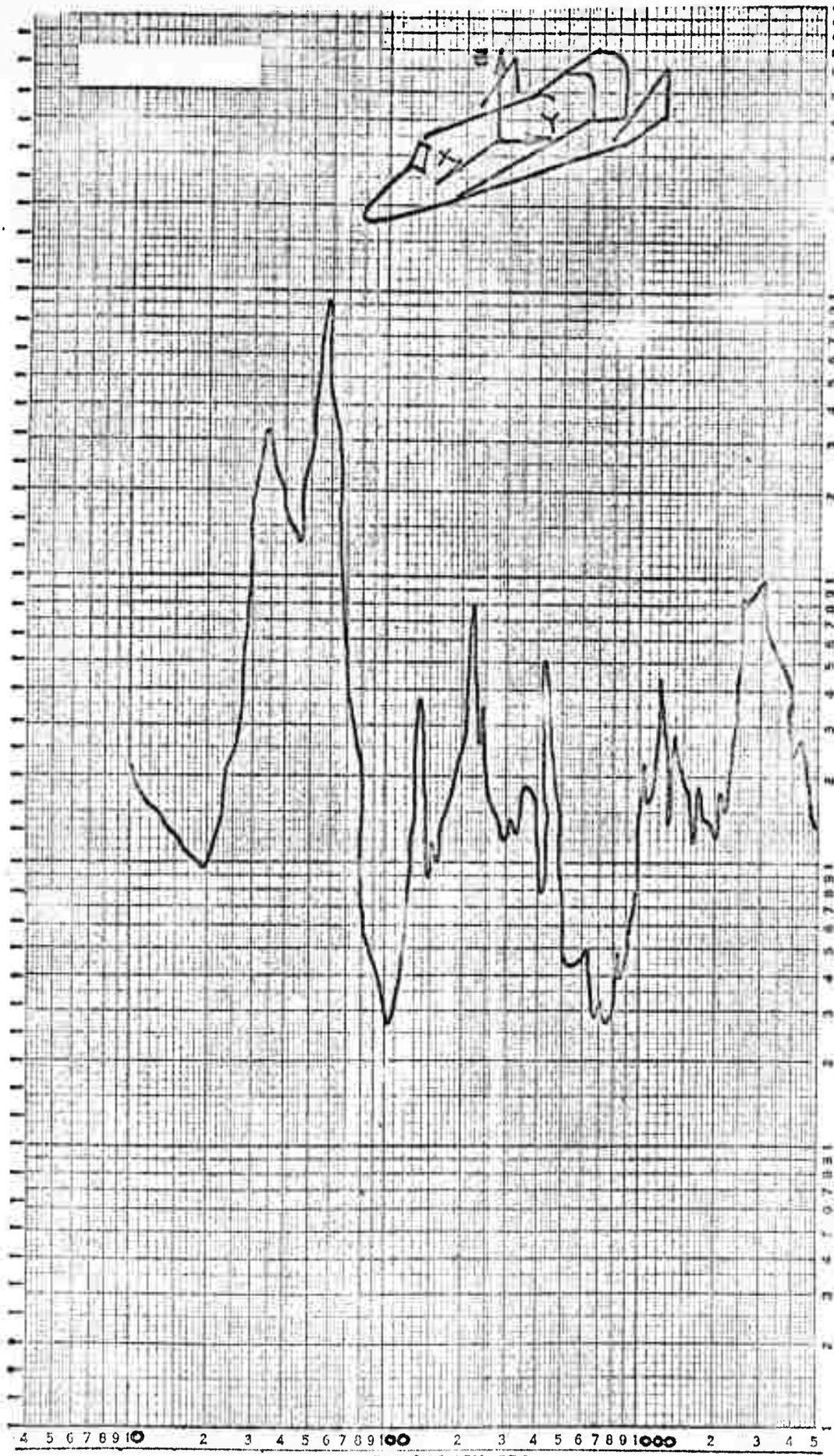


CONDITION NO.

TEST NO.

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Y AXIS (M = .5-.7 All δe, δr)	FIGURE 4.5-62
CHECK						D2-80713
APPR						
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 129

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CONDITION NC

TEST NO.

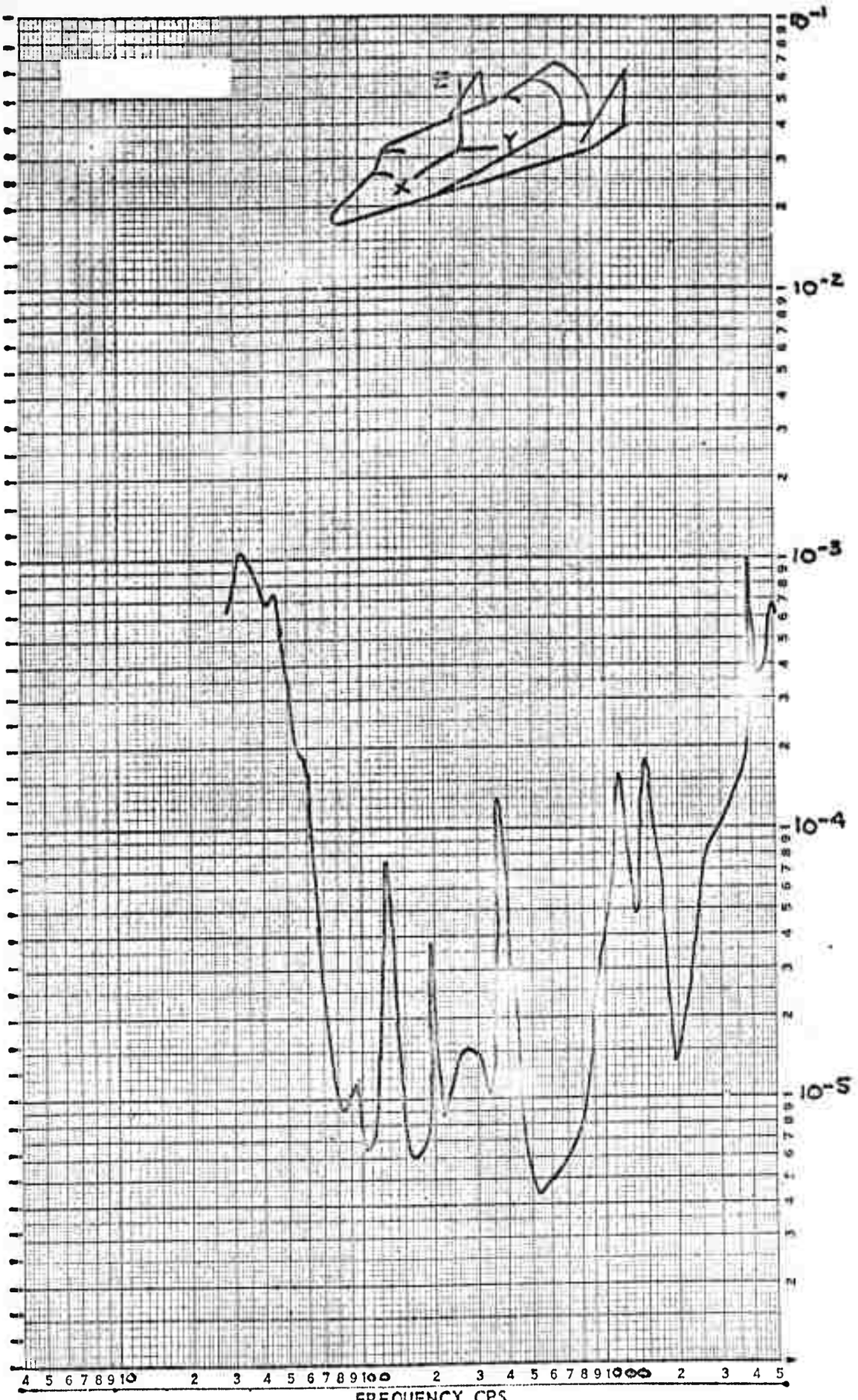
CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Y AXIS (M = .8-1.1 δe, $\delta r \neq 0$)	FIGURE 4.5-63
CHECK						D2-80713
APPR						
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 130



TEST NO.

CONDITION NC.

			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Y AXIS (M = .8-1.1 δe = δc = 0)	FIGURE 4.5-64
CALC						
CHECK						D2-80713
APPD					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 131
APPD						

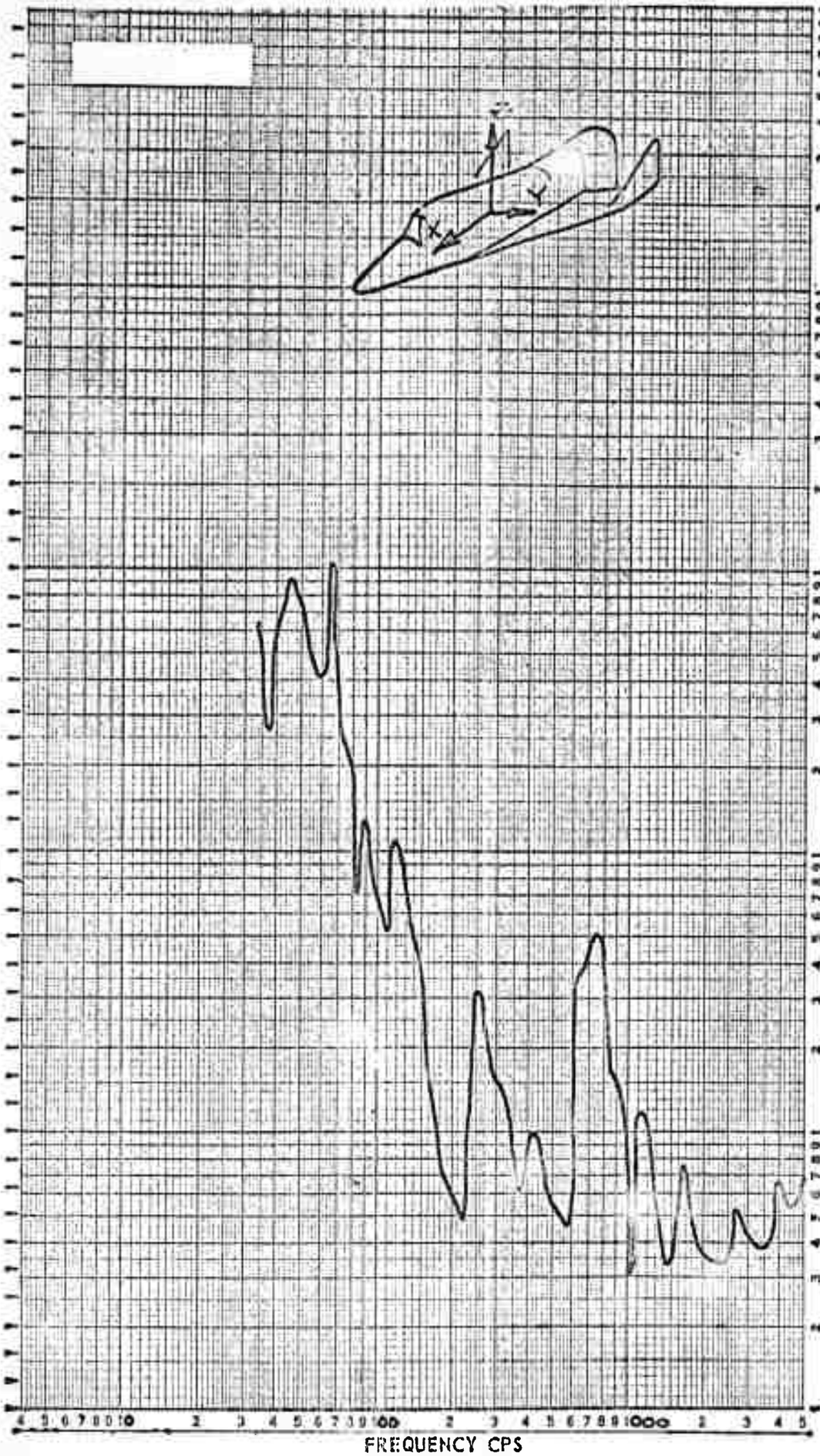


CONDITION N.C.

TEST NO.

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Z AXIS ($M = .5$-$.7$ All δe, δr)	FIGURE 1.5-65
CHECK						D2-80713
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 132
APPR						

2-5[illegible]-4-29



CONDITION NC

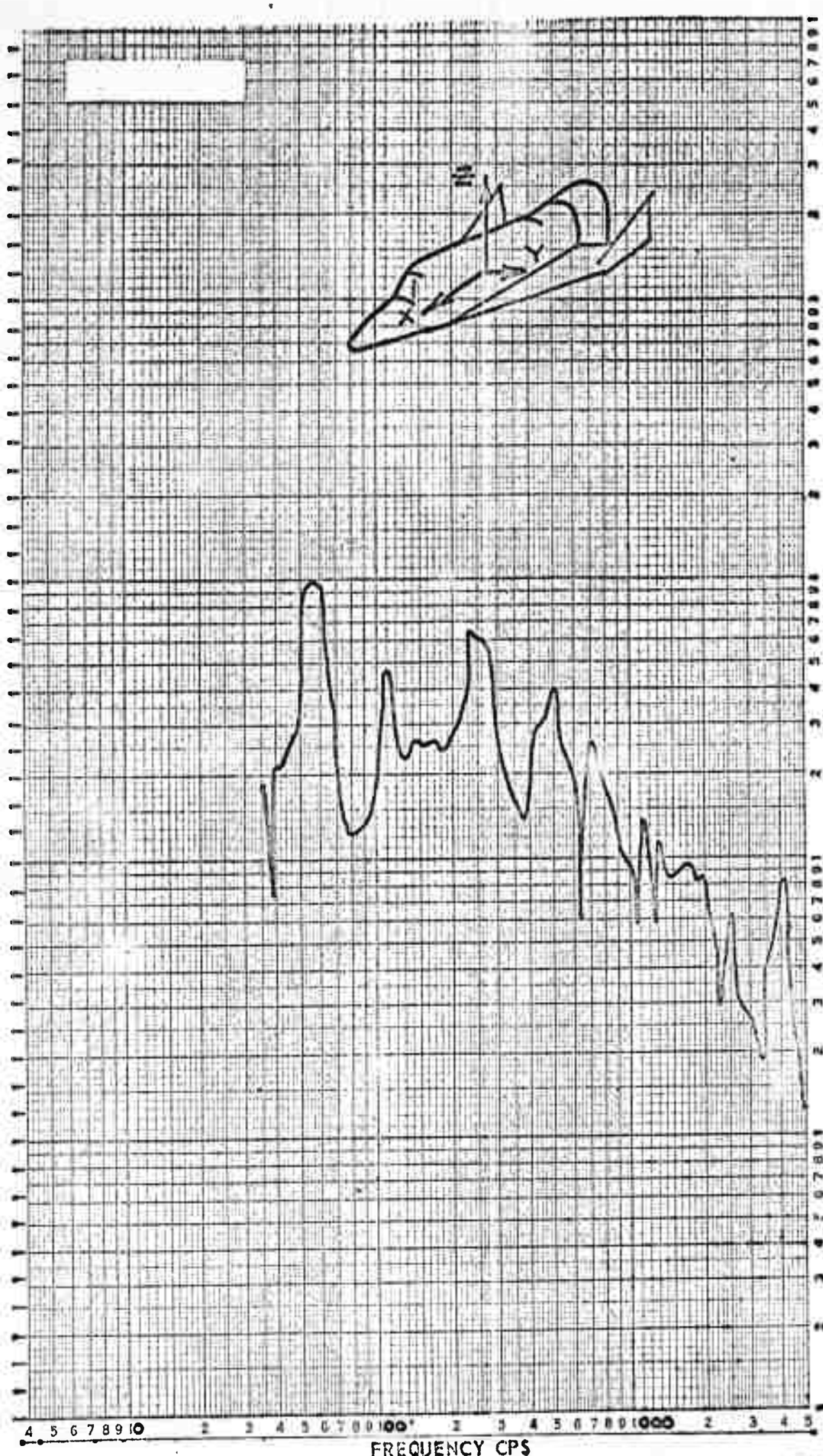
TEST NO.

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Z AXIS (M = .8-1.1 δe, $\delta r \neq 0$)
CHECK					
APPR					
APPR					
					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON

FIGURE 4.5-66

D2-80713

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CONDITION NC

TEST NO.

			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Z AXIS (M = .8-1.1 $\delta e = \delta r = 0$)	FIGURE 4.5-67
CALC						
CHECK						D2-80713
APPR						
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 134

5.0 SUPERSONIC WIND TUNNEL TEST

5.1 PURPOSE

The purpose of this test was to measure the magnitude, frequency spectrum, and space correlation of fluctuating aerodynamic pressure on the glider in the supersonic speed regime due to:

(a) Fluctuating base pressures

(b) Fluctuating cavity pressures

(c) Separated flow

5.2 TEST FACILITY

The test was conducted during the period of 22 March 1962 through 23 March 1962 in the Boeing Supersonic Wind Tunnel Facility at Seattle, Washington.

5.3 MODEL CONFIGURATION

The model glider wind tunnel configuration drawing is shown in Figure 5.3-1.

5.4 TEST PROCEDURE

The test procedure in the supersonic wind tunnel was conducted in the following manner:

(a) The model configuration was set at the appropriate elevon and rudder deflection with the glider at zero angle of attack.

(b) Tunnel test conditions were initiated at the appropriate Mach number and angle of attack.

(c) The acoustic vibration and tunnel parameters were recorded when the tunnel test section reached a stable condition (2 seconds after starting shock passed through test section).

5.5 TEST RESULTS

5.5.1 Tunnel Test Conditions

Tabulated Mach numbers, elevon deflections, and rudder deflections specified for the supersonic wind tunnel test program are shown in Figure 5.5-1. Figure 5.5-2 shows nominal dynamic pressure, total pressure, total temperature, test section static pressure, and Reynolds number/ft at each Mach number tested.

5.5.2 Acoustic Test Results - Sound Pressure Levels

The acoustic data taken during the supersonic wind tunnel portion of the test program are considered to be invalid due to the vibration response of the Statham pressure transducers. An explanation of the basis of this judgment and how the data can be used is given in the following paragraphs.

Given the vibration and acoustic sensitivities and vibration environment of the Statham transducer, the transducer output response due to vibration can be calculated in equivalent sound pressure levels. The equation is defined as:

$$1/3 \text{ Octave Band Level} = 10 \log \frac{p^2 \text{ (1/3 octave band sound pressure)}}{(.0002\,\mu\text{bar})^2}$$

$$= 10 \log \eta_v^2 - 10 \log \eta_a^2 + 10 \log \Delta f + 10 \log \text{APSD} + 14$$

where

$10 \log \eta_v^2$ = Vibration sensitivity of Statham Transducer in db re: 1 millivolt/g (Figure 3.2-1) + system corrections (74 db + relative response given in Figure 3.1-7)

$10 \log \eta_a^2$ = Acoustic sensitivity of Statham Transducer including system corrections in db re: 1 volt/bar (Figures 3.1-27 through 3.1-44)

$10 \log \Delta f$ = 1/3 octave band width correction in db

$10 \log \text{APSD}$ = Average acceleration power spectral density for the specific 1/3 octave band in db re: $1g^2/\text{cps}$ (Figures 4.5-48 through 4.5-56 for transonic wind tunnel tests or Figures 5.5-10 through 5.5-16 for supersonic wind tunnel tests)

The calculated equivalent sound levels were then compared to the sound pressure levels determined by the acoustic data reduction system (Figure 3.1-49). The comparison showed that the data measured by the glider pressure transducers in the supersonic wind tunnel was probably due intirely to the vibration response of the transducers.

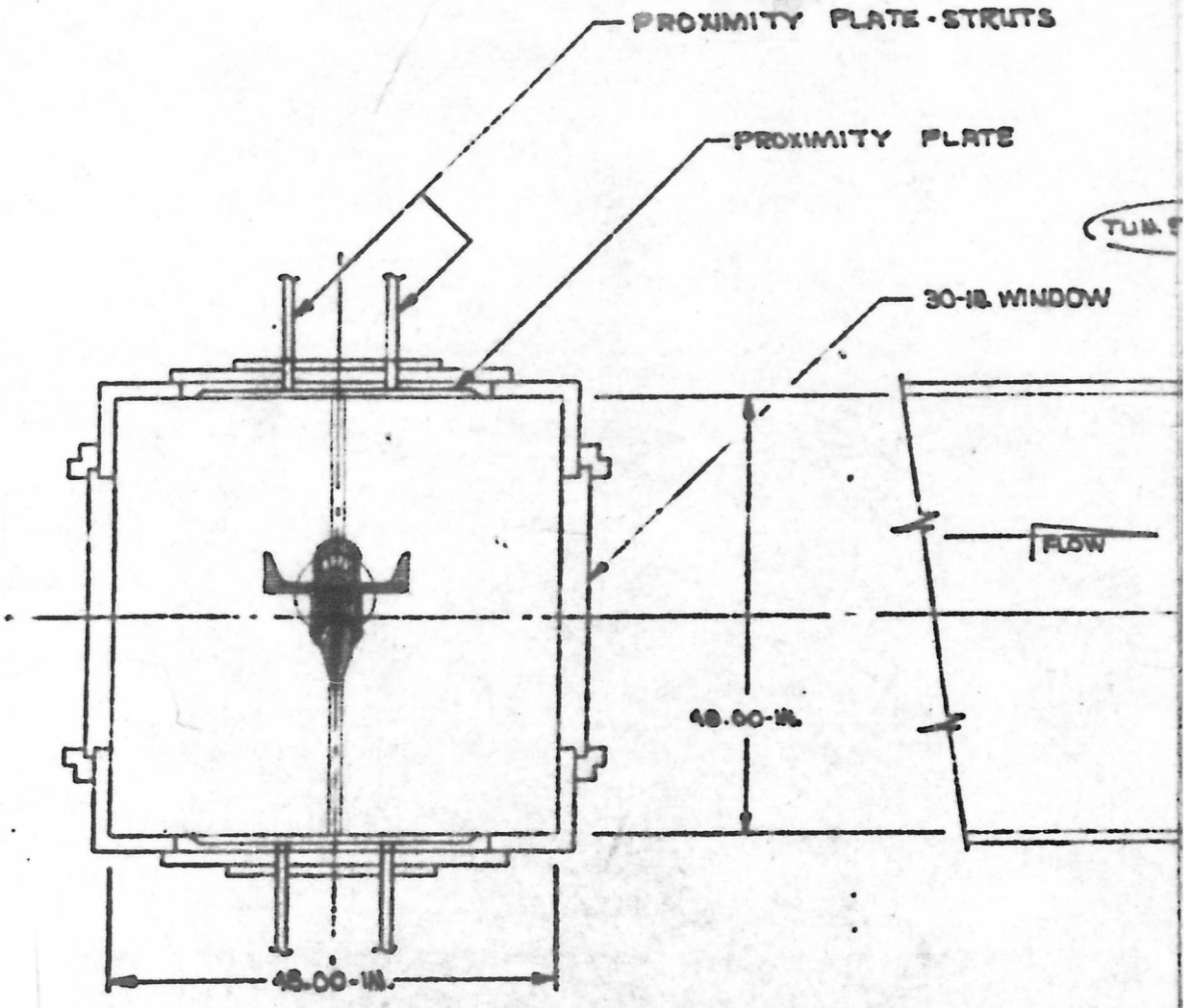
Figures 5.5-3 through 5.5-9 give envelopes of data measured by the model glider transducers in the supersonic wind tunnel test program. Although these data are invalid, they serve to indicate an upper bound to the aerodynamic noise levels on the model X-20 glider in the supersonic speed regime.

5.5.3 Acoustic Test Results - Space Correlation Coefficients

Space correlation coefficients obtained are considered to be invalid for reasons given in Section 5.5.2.

5.5.4 Vibration Test Results

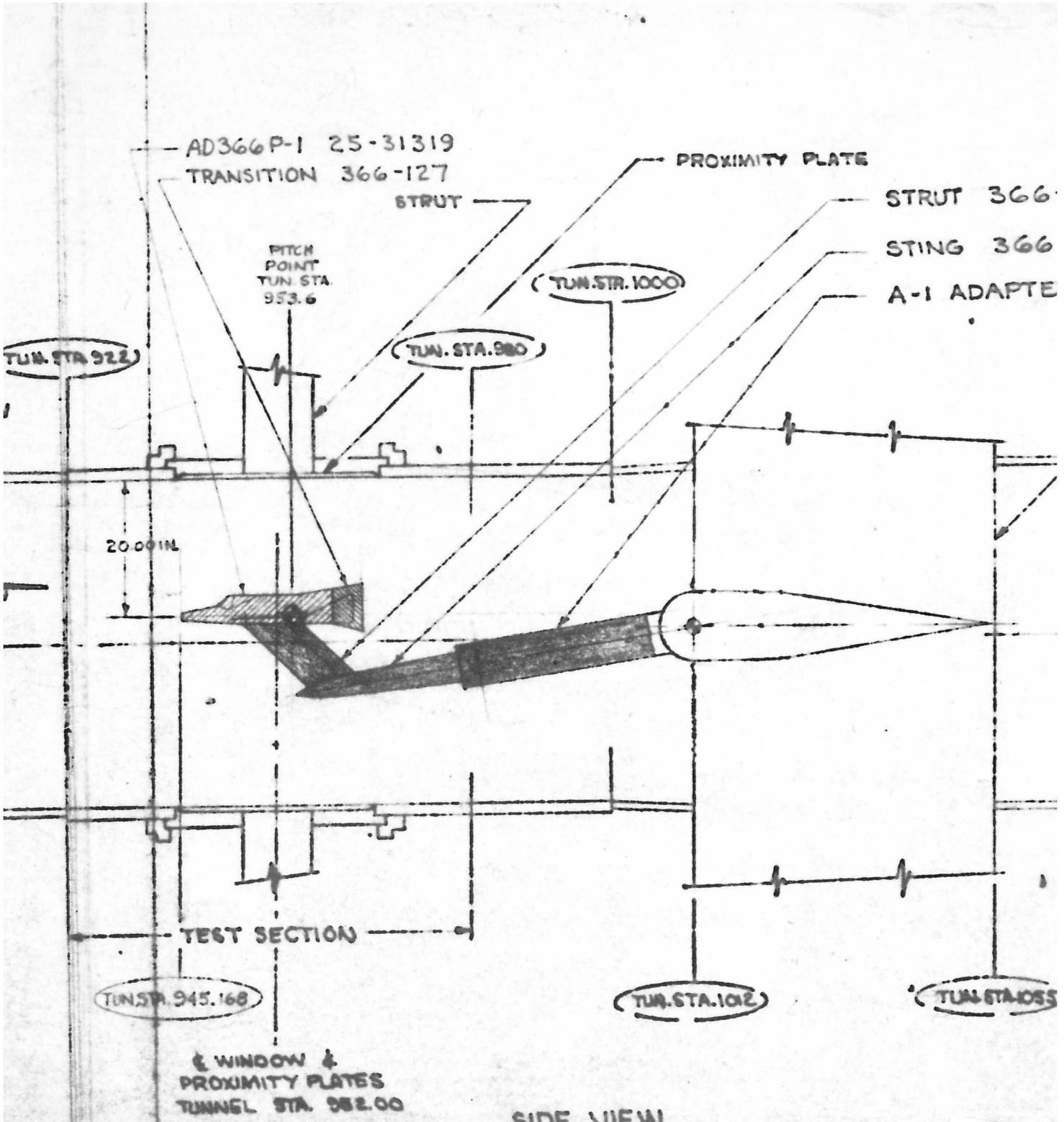
Figures 5.5-12 through 5.5-16 shows envelopes of model glider vibration data measured during the supersonic wind tunnel test program.



1

Figure 5.3-1

CALC.	TRBEECH	4-2-62	REVISED	DATE	INSTALLATION DRAWING	SHIP-134 AD566 P-1
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APPD.					BOEING AIRPLANE COMPANY	PAGE



SIDE VIEW

MODEL INSTALLATION
BOEING SUPERSONIC WIND TUNNEL

2

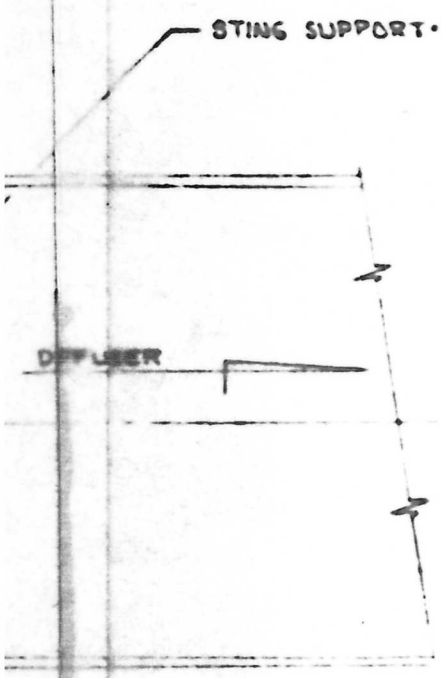
TUNNEL CONFIGURATION :

SPHERES:

TWO SPHERES WITH FLOW TUBE.

VALVES:

1. BUTTERFLY VALVE WITH ALUMINUM SEAL FOR MIN. GAP
2. PLUG VALVE WITH RUBBER SEAL.



SETTLING CHAMBER:

1. SETTLING CHAMBER WITH 1/4" PERFORATED PLATE, SIX SPRING MOUNTED 14 MESH SCREENS, DEFLECTOR BRACKETS, AND OUTER DEFLECTOR PLATES.
2. TUNNEL TOTAL PRESSURE MEASURED BY PITOT PROBE AND ABSOLUTE PRESSURE TRANSDUCER LOCATED AT TUN. STA. 483.
3. TUNNEL TOTAL TEMPERATURE MEASURED BY A THERMOCOUPLE LOCATED AT TUNNEL STA. 473.

NOZZLE:

SEMI-FLEXIBLE ONE INCH STEEL PLATE WITH MACH NUMBERS SET BY FORMING THE PLATE TO CALIBRATED CONTOURS.

TEST SECTION:

4' x 4' TEST SECTION,

3

MODEL MOUNTING:

MODEL WAS MOUNTED TO THE 366-120 STRUT WHICH WAS ATTACHED TO THE 366-121 STING - THEN TO THE A-1 ADAPTER - THEN THE MAIN STING SUPPORT STRUT.

STRUT:

STANDARD STRUT - STING SUPPORT.

DIFFUSER:

CONSTANT AREA SUPERSONIC DIFFUSER

EXHAUST TOWER:

EXHAUST TOWER WITH VERTICAL 4 MESH SCREENS.

FIGURE 5.3-1
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GLIDER WITH TRANSITION CONFIG.

RUN No.	MACH No.	α	δ_e	δ_r
1	1.5	-10°	-10°	0°
2	1.5	0°	-10°	
3	1.5	+10°	-10°	
4	1.5	+10°	+10°	
5	2.0	+10°	+10°	
6	2.0	+10°	-10°	
7	2.0	0°	-10°	
8	2.0	-10°	-10°	
9	2.5	-10°	-10°	
10	2.5	0°	-10°	
11	2.5	+10°	-10°	
12	2.5	+10°	+10°	
13	3.0	+10°	+10°	
14	3.0	+10°	-10°	
15	3.0	0°	-10°	
16	3.0	-10°	-10°	
17	3.5	-10°	-10°	
18	3.5	0°	-10°	
19	3.5	+10°	-10°	
20	3.5	+10°	+10°	
GLIDER W/O TRANSITION CONFIG				
21	3.5	0°	-30°	0°
22	3.5	-10°	-30°	
23	3.5	-10°	0°	
24	3.5	0°	0°	
25	2.5	0°	0°	

GLIDER W/O TRANSITION CONFIG.

RUN No.	MACH No.	α	δ_e	δ_r
26	2.5	-10°	0°	0°
27	2.5	-10°	-30°	0°
28	2.5	0°	-30°	
29	1.5	0°	0°	
30	1.5	-10°	0°	
31	1.5	-10°	-30°	
32	1.5	0°	-30°	
33	1.5	0°	0°	+35°
34	1.5	-10°		
35	2.5	-10°		
36	2.5	0°		
37	3.5	0°		
38	3.5	-10°		
39	3.5	+18°		
40	1.5	-10°		
41	1.5	-6°		
42	1.5	-3°		
43	1.5	0°		
44	1.5	+3°		0°
45	1.5	+6°		
46	1.5	+10°		
47	1.5	+12°		
48	1.5	+15°		
49	1.5	+18°		
50	1.6	+10°		
51	1.7	+10°		

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SUPERSONIC WIND TUNNEL TEST CONDITIONS

Figure 5.5-1

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2-7000

SUPERSONIC TUNNEL OPERATION
(Nominal Values)

Mach Number	Dynamic Pressure (psf)	Total Pressure psia	Total Temperature (°R)	Test Section Static Pressure	Reynolds Number/ft x 10^6
1.5	1200	19.7	510	5.3	6.5
2.0	1400	27	510	3.5	7.5
2.5	1500	40	510	2.4	8.8
3.0	1500	60	510	1.64	10
3.5	1450	90	515	1.17	11.8

Figure 5.5-2

ENVELOPES OF TRANSDUCER VIBRATION RESPONSE IN EQUIVALENT SOUND PRESSURE LEVELS - SUPERSONIC W/T TESTS

MODEL GLIDER TRANSDUCER LOCATIONS NO. 1, 2, 3, AND 4

FIGURE 5.5-3

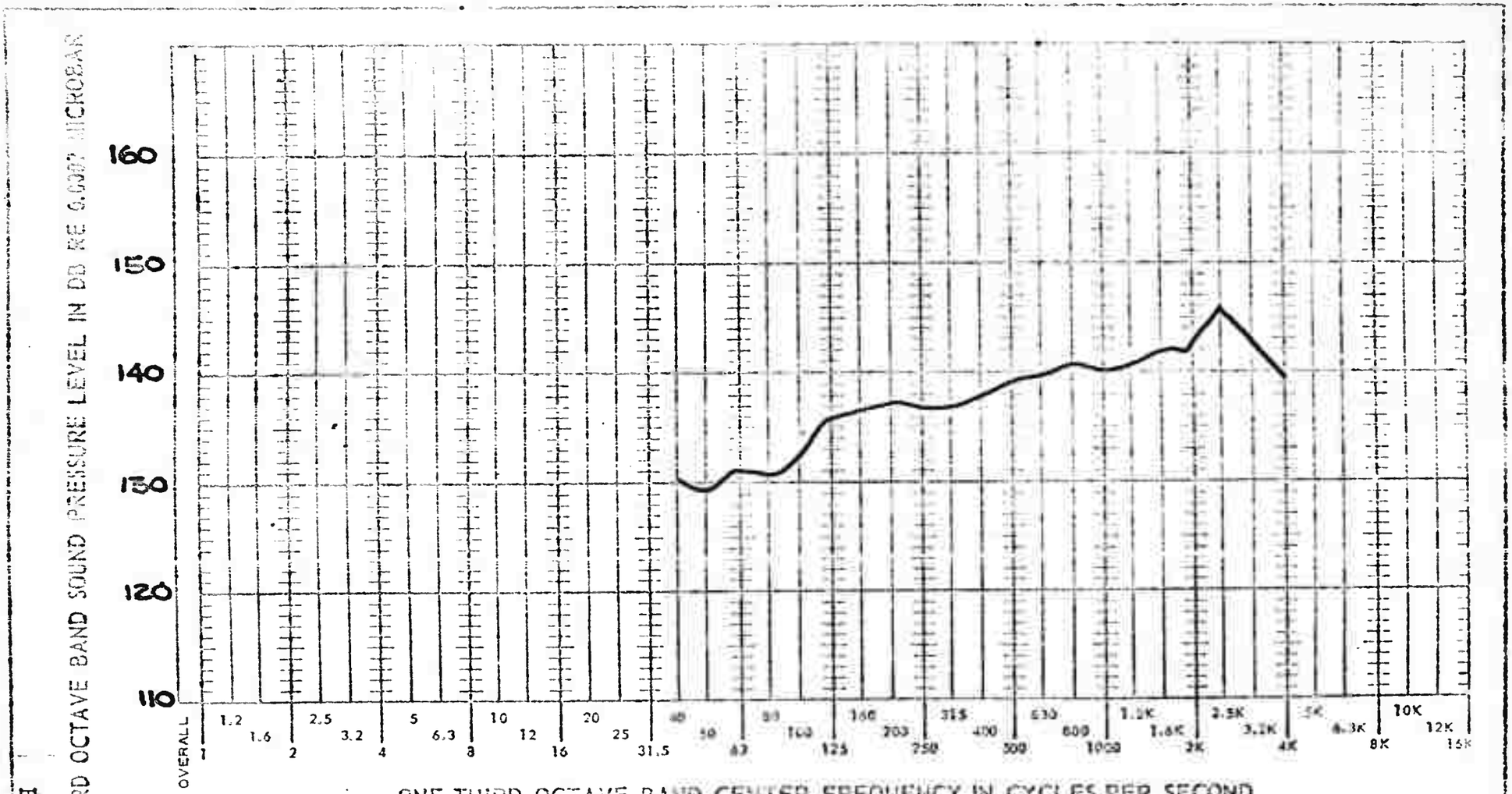


FIGURE 5.5-4

ENVELOPES OF TRANSDUCER VIBRATION RESPONSE IN

EQUIVALENT SOUND PRESSURE LEVELS - SUPERSONIC W/T TESTS

MODEL GLIDER TRANSDUCER LOCATIONS NO. 6

ENVELOPES OF TRANSDUCER VIBRATION RESPONSE IN EQUIVALENT SOUND PRESSURE LEVELS - SUPERSONIC W/T TESTS

MODEL OLDER TRANSDUCER LOCATIONS NO. 7

FIGURE 5.5-5

X32
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ONE-THIRD OCTAVE BAND SOUND PRESSURE LEVEL IN DB RE 0.0002 MICROBAR
160
150
140
130
120
110
OVERALL
1
1.2
1.6
2
2.5
3.2
5
6.3
8
10
12
16
20
25
31.5
40
50
63
80
100
125
160
200
250
315
400
500
630
800
1000
1250
1600
2000
2500
3150
4000
5000
6300
8000
10000
12500
15000
ONE-THIRD OCTAVE BAND CENTER FREQUENCY IN CYCLES PER SECOND
ENVELOPES OF TRANSDUCER VIBRATION RESPONSE IN
EQUIVALENT SOUND PRESSURE LEVELS - SUPERSONIC W/T TESTS
MODEL G LIDER TRANSDUCER LOCATION NO. 8

FIGURE 5.5-6

ENVELOPES OF TRANSDUCER VIBRATION RESPONSE IN

EQUIVALENT SOUND PRESSURE LEVELS - SUPERSONIC W/T TESTS

MODEL GLIDER TRANSDUCER LOCATIONS NO. 9, 10

FIGURE 5.5-7

ONE-THIRD OCTAVE BAND CENTER FREQUENCY IN CYCLES PER SECOND

ENVELOPES OF TRANSDUCER VIBRATION RESPONSE IN

EQUIVALENT SOUND PRESSURE LEVELS - SUPERSONIC W/T TESTS

MODEL GLIDER TRANSDUCER LOCATIONS NO. 11, 12

FIGURE 5.5-8

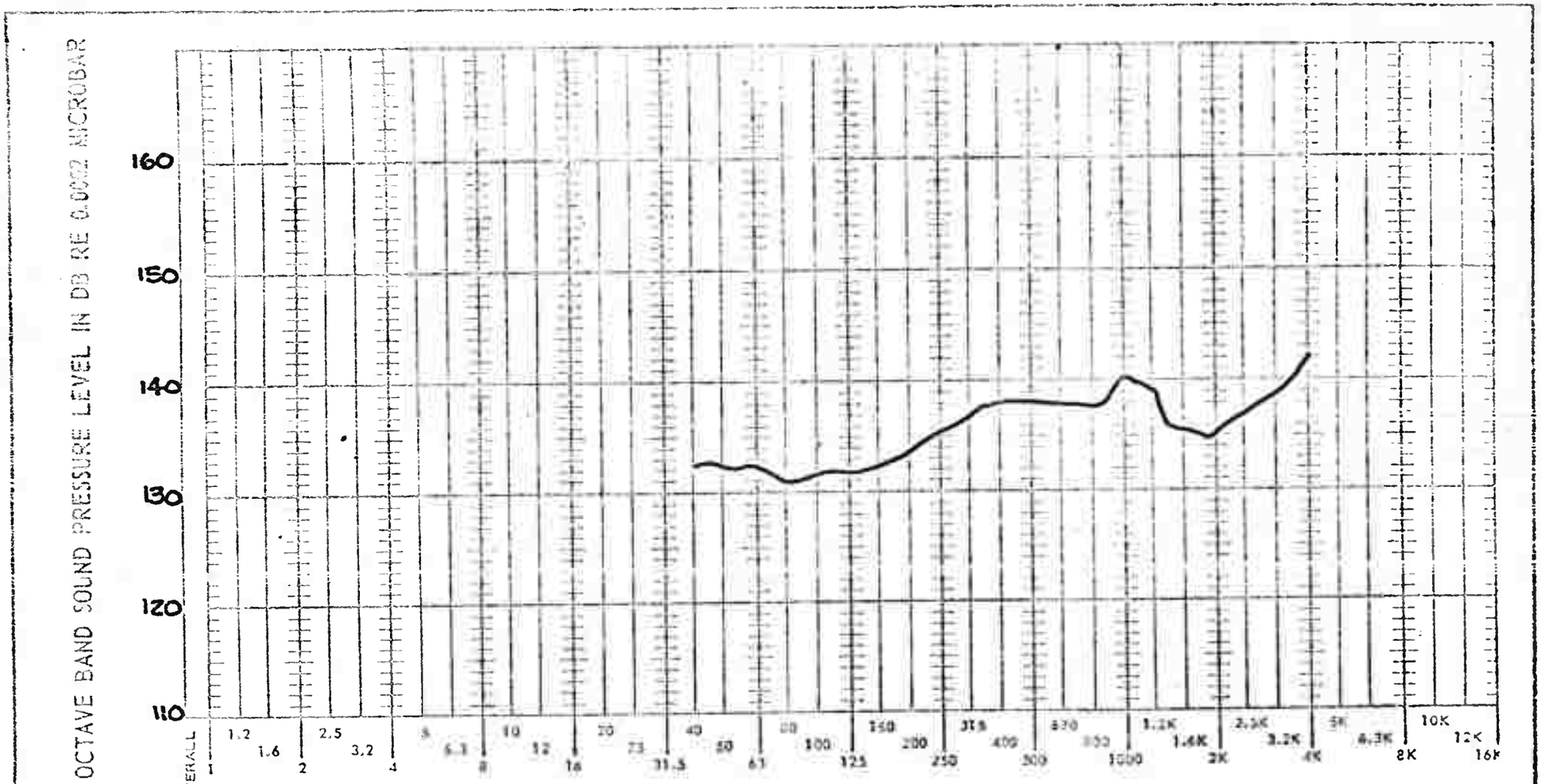
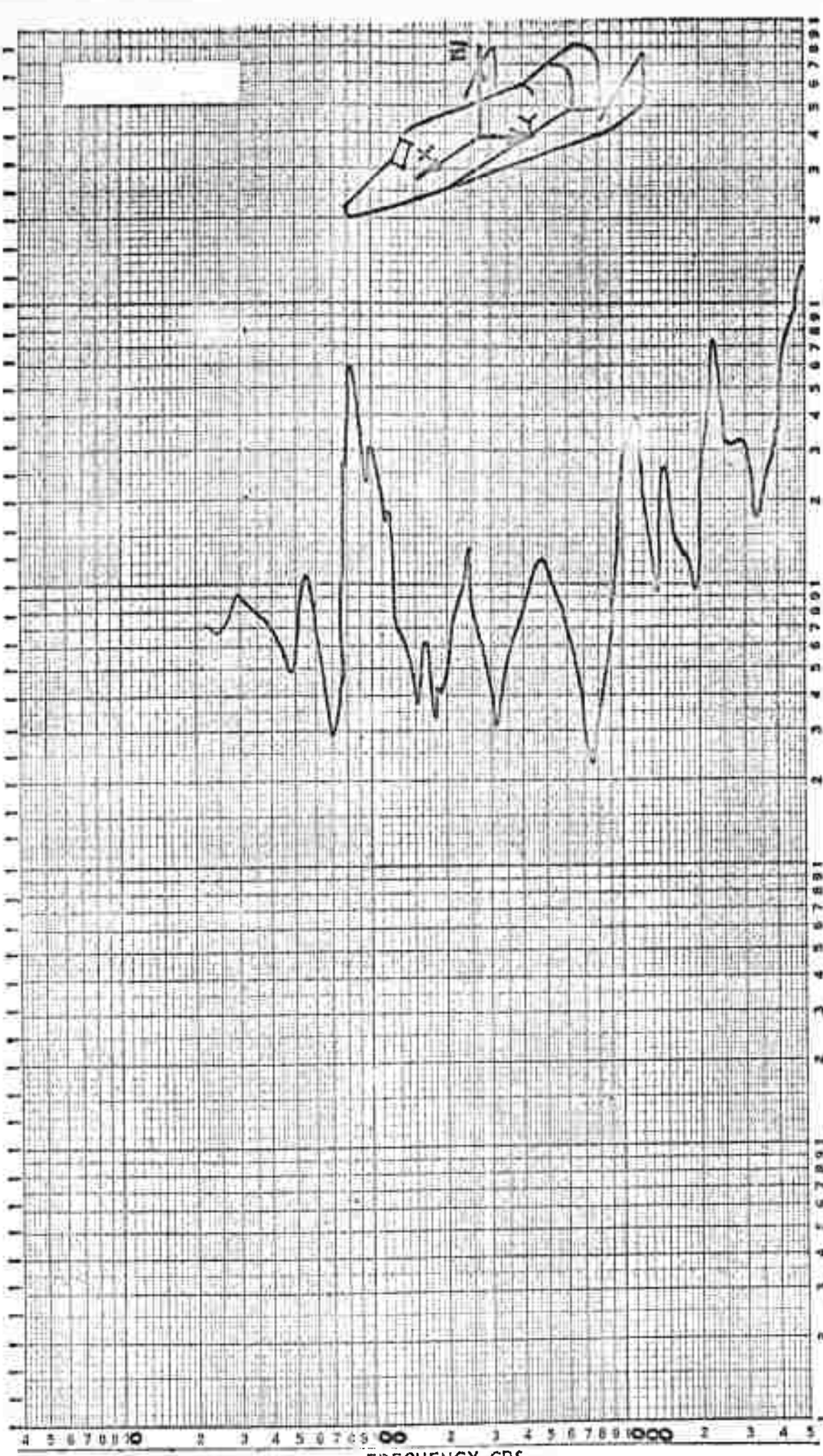


FIGURE 5.5-9

ENVELOPES OF TRANSDUCER VIBRATION RESPONSE IN

EQUIVALENT SOUND PRESSURE LEVELS - SUPERSONIC W/T TESTS

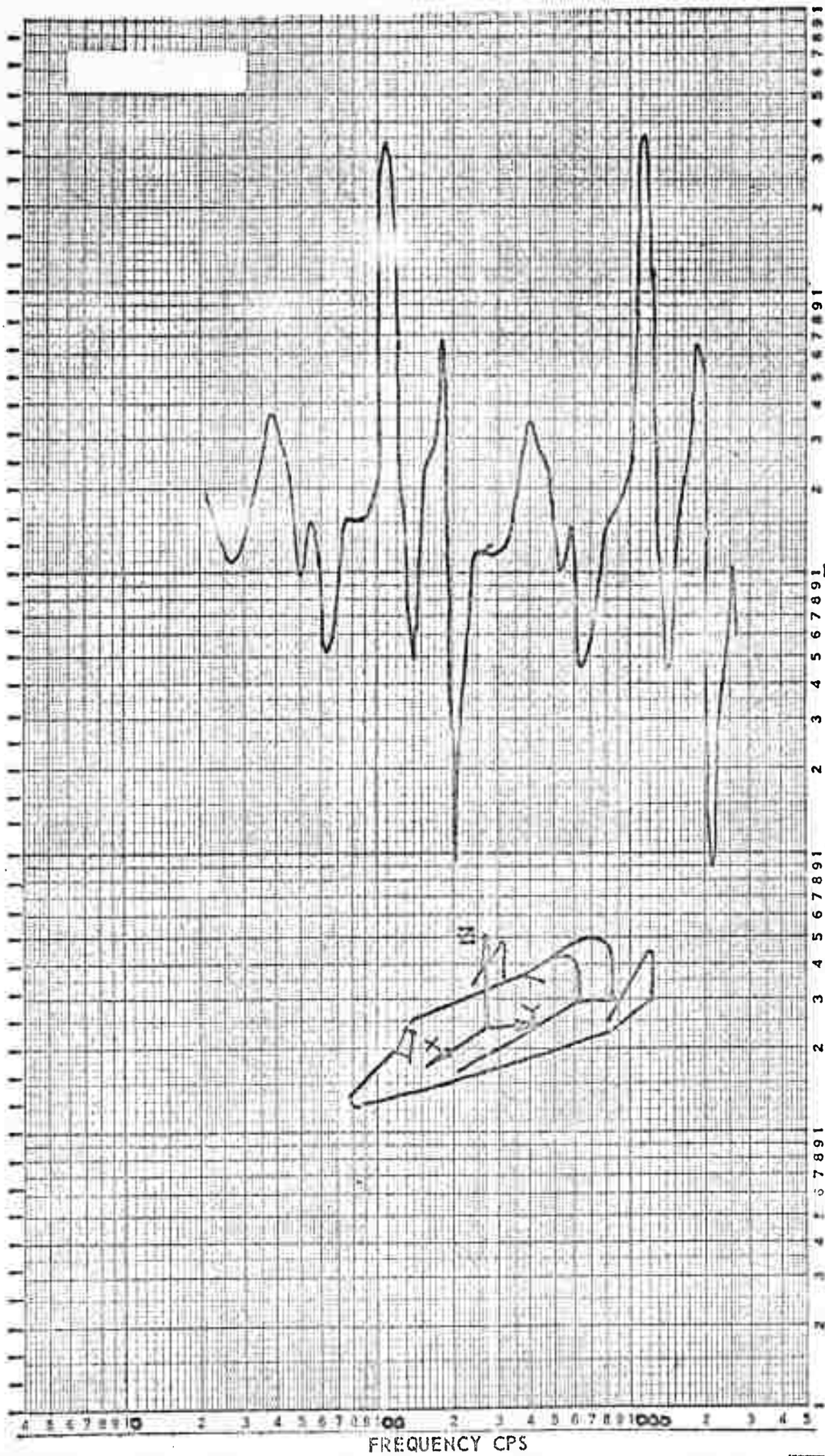
MODEL GLIDER TRANSDUCER LOCATIONS NO. 15A, 15B, 16A, 16B, 17



CONDITION NO.

TEST NO.

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Y AXIS (M = 1.5 All δe, δr)	FIGURE 5.5-10
CHECK						D2-80713
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APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 148

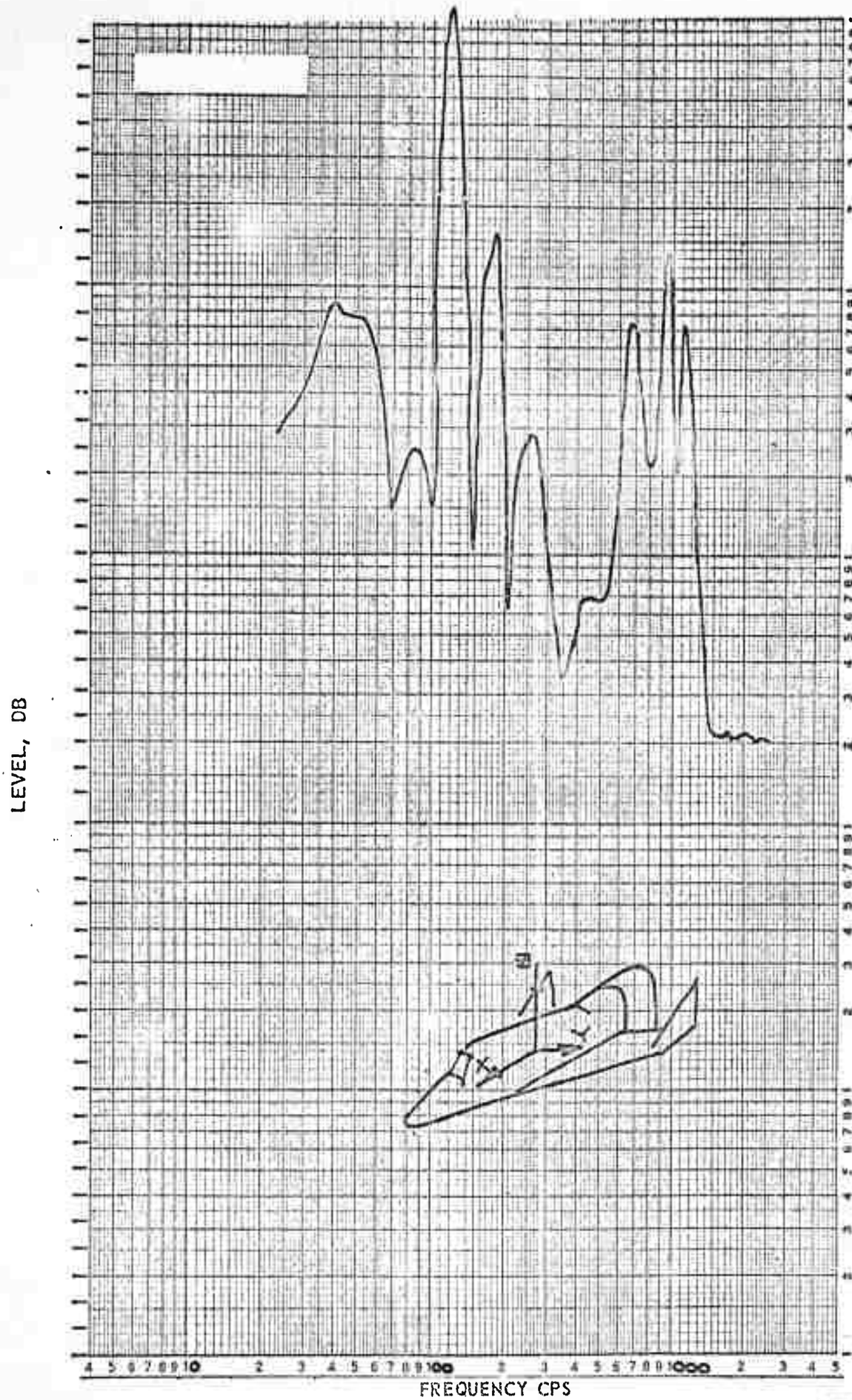


CONDITION NC

TEST NO.

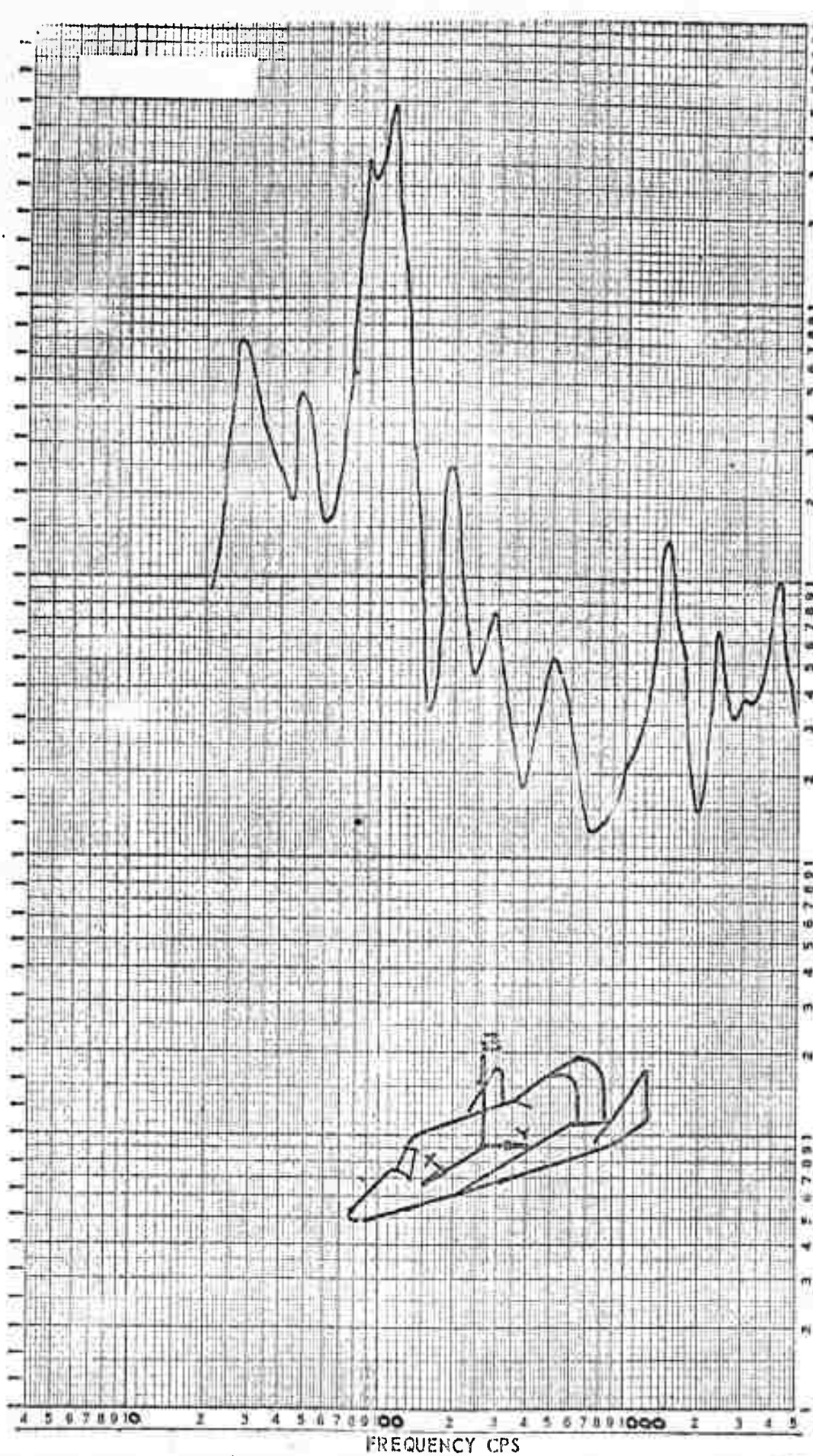
CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Y AXIS (M = 2.0 & 2.5 All δe, δr)	FIGURE 5.5-11
CHECK						D2-80718
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 149
APPR						

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CONDITION NC

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Y AXIS (M = 3.0 All δ e, δ r)	FIGURE 5.5-12
CHECK						
APPR						D2-80713
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 150

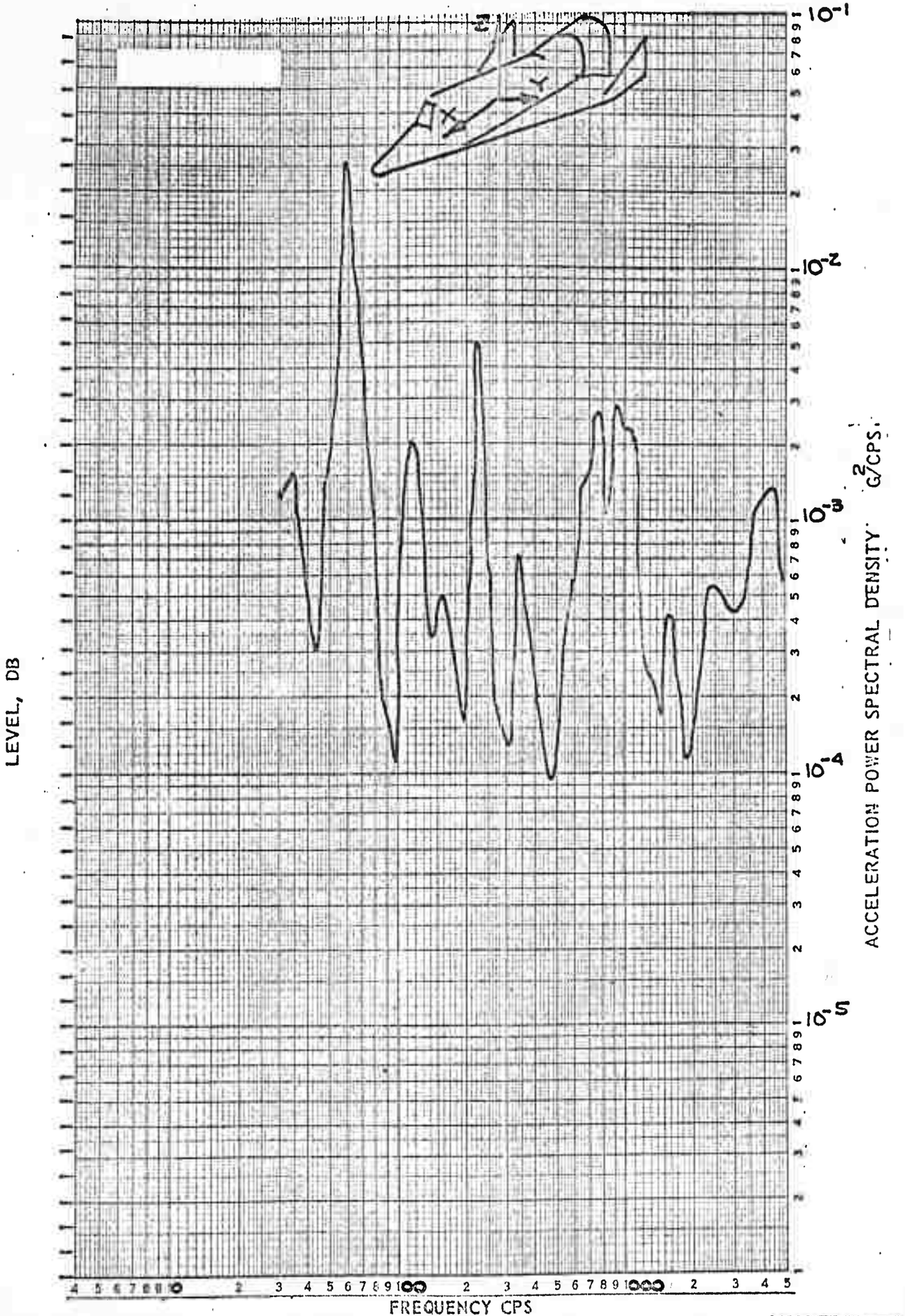


CONDITION NC

TEST NO.

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Y AXIS (M = 3.5 All δ e, δ r)	FIGURE 5.5-13
CHECK						D2-80713
APPR						
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 151

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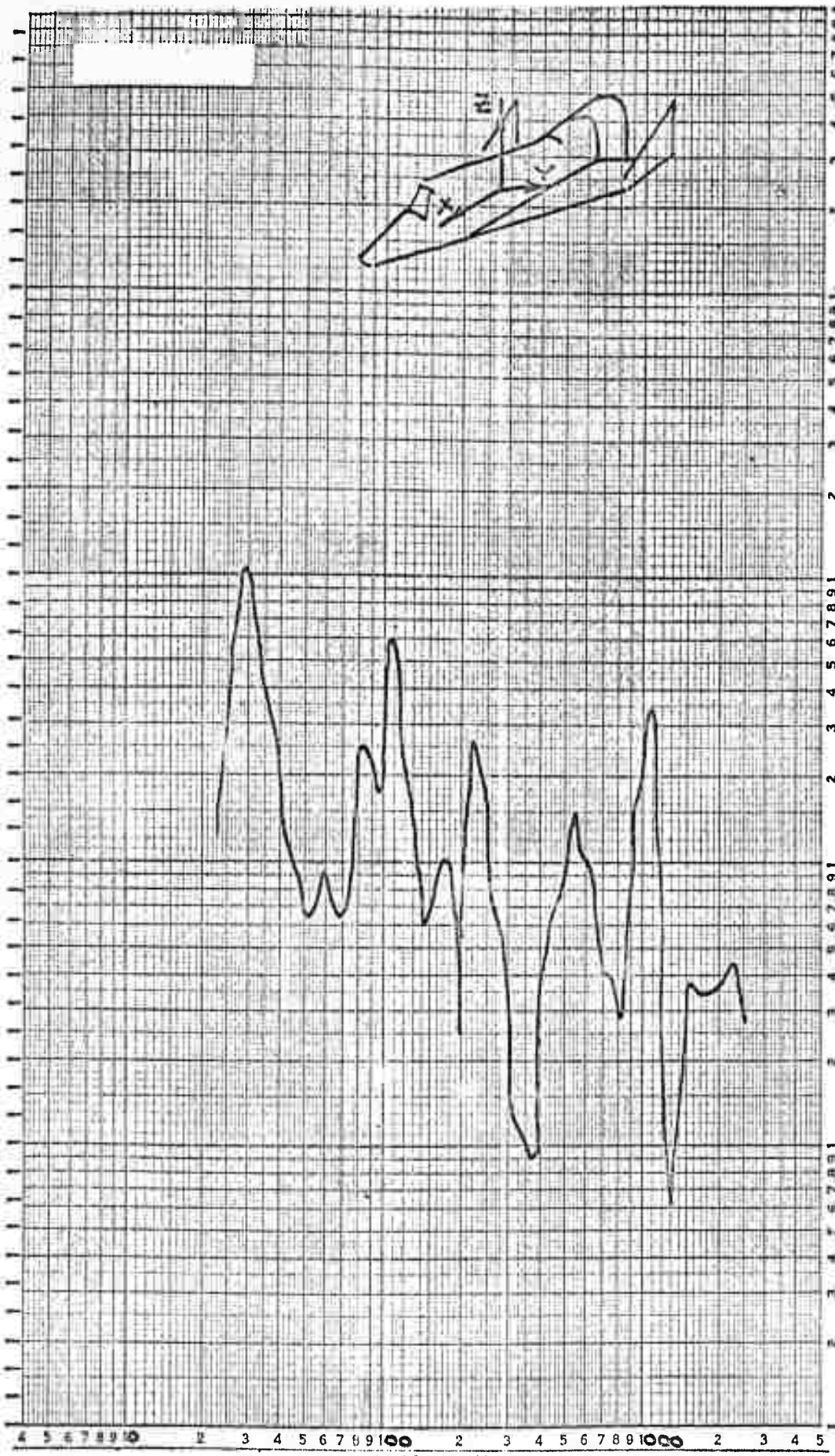


CONDITION NC

TEST NO.

160

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Z AXIS (M = 1.5 All δ e, δ r)	FIGURE 5.5-11
CHECK						D2-80713
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 152
APPR						



TEST NO.

CONDITION N.C.

CALC			REVISED	DATE
CHECK				
APPR				
APPR				

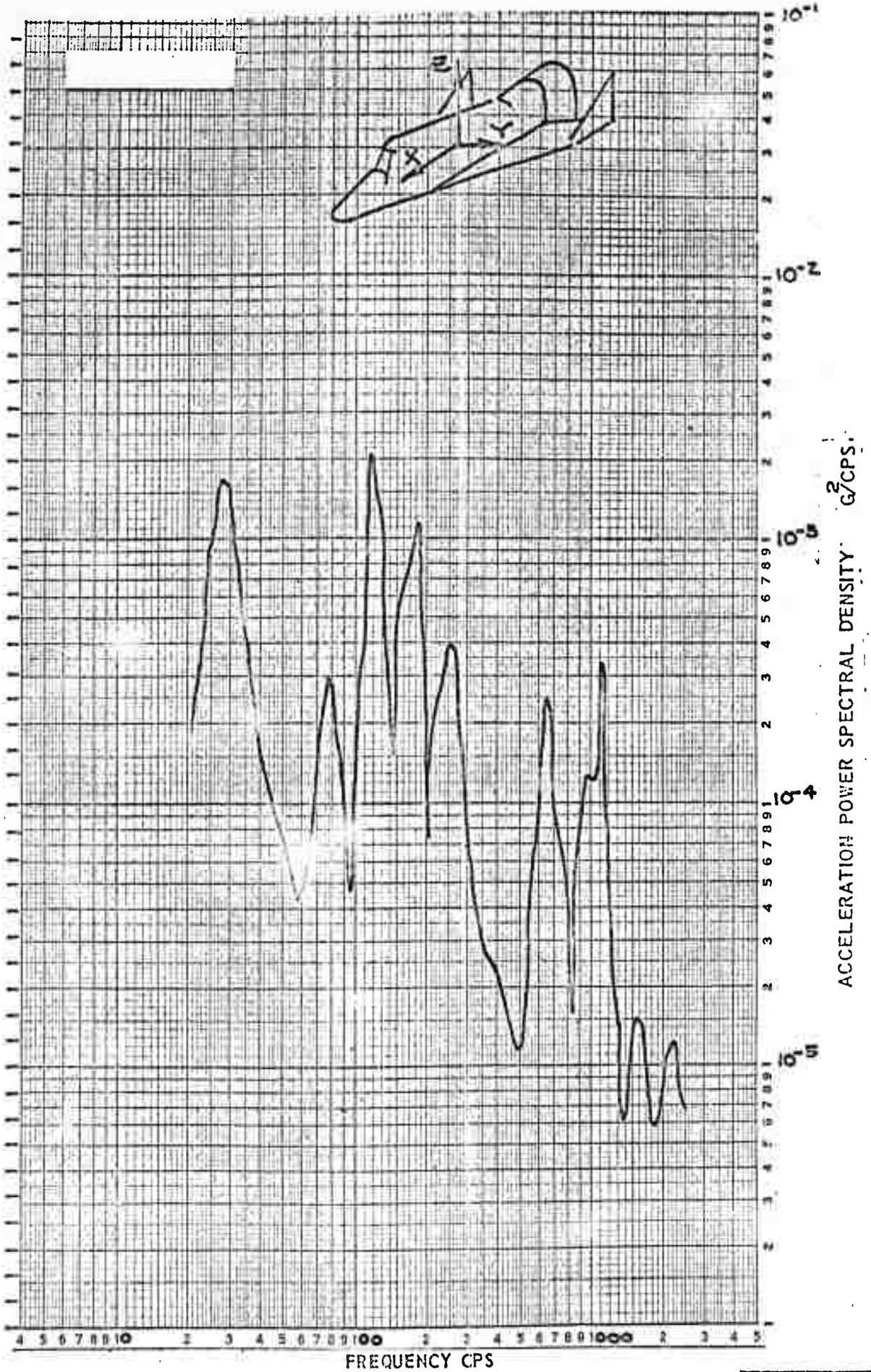
ENVELOPE OF MODEL GLIDER VIBRATION DATA - Z AXIS
(M - 2.0 & 2.5 All δ e, δ r)

FIGURE 5.5-15

D2-80713

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TEST NO. CONDITION NC

CALC			REVISED	DATE	ENVELOPE OF MODEL GLIDER VIBRATION DATA - Z AXIS (M = 3.0 & 3.5 All δ e, δ r)
CHECK					
APPR					
APPR					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON

FIGURE 5.5-16

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16.2

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UNCLASSIFIED